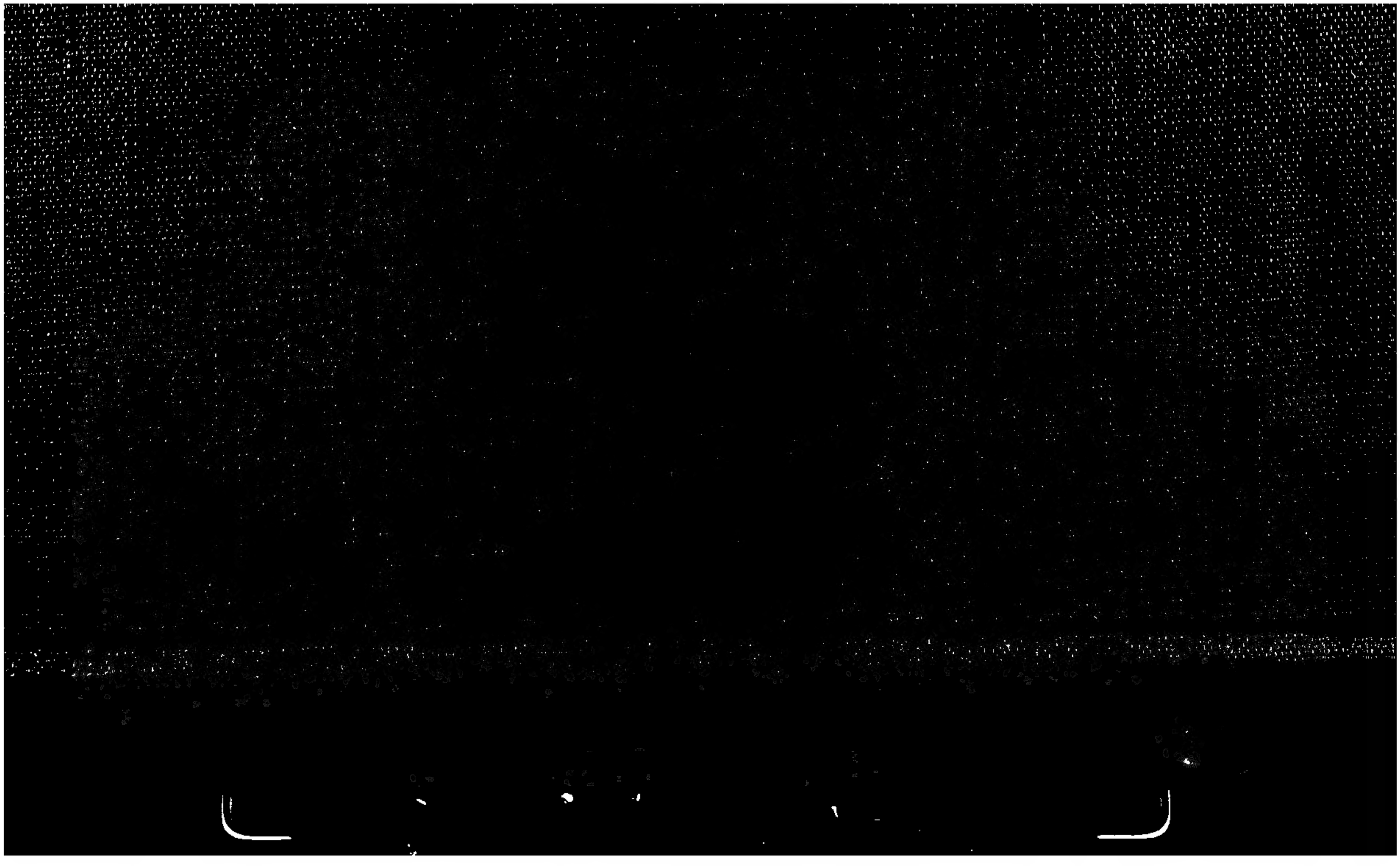

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THE NEW YORK BOTANICAL GARDEN

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MARSHALL A. HOWE
and
CAROL H. WOODWARD

VOLUME XXXV

WITH 47 TEXT-FIGURES, AND ONE PLATE

1934

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JOURNAL
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DWARF DAYLILIES
A. B. STOUT

DYED, GILDED, AND SILVERED DECORATIVES
EDWARD J. ALEXANDER

EXHIBIT OF AQUATIC PLANTS AT GARDEN

NATIVE IRIS NOTES—I
JOHN K. SMALL

ORNAMENTAL LADIES'-TRESSES
JOHN K. SMALL

CONFERENCE NOTES FOR DECEMBER
A. B. STOUT

A GLANCE AT CURRENT LITERATURE
CAROL H. WOODWARD

NOTES, NEWS, AND COMMENT

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DWARF DAYLILIES

It has been about twenty years since the plant collector George Forrest discovered certain daylilies in southwestern China which in the natural habitat grow less than a foot tall. These appear to be distinct from and more dwarf than the smallest of the previously known species, such as *Hemerocallis Dumortierii, H. Middendorffii,* and *H. minor.*

From the material collected by Forrest three new species were described under the names *H. Forrestii, H. nana,* and *H. plicata.* Plants of these were soon brought into cultivation in England and later in America. It seems that these daylilies have not thrived in these countries. Apparently they are not fully hardy or the proper conditions for successful culture have not been supplied. Yet these dwarf types of daylilies should be of value for culture and for use in hybridizing with other types for the development of dwarf clons that are hardy and adapted to general culture.

Hemerocallis nana. The *H. nana* is clearly a well-defined type of dwarf stature. A photograph of a wild plant in its natural habitat was shown in 1916 (Jour. Roy. Hort. Soc. **42**: *f. 12*), a description appeared in 1917 (Notes Bot. Gard. Edinburgh **10**: 39), and later there was published an illustration in color (Bot. Mag. **148**: *pl. 8968.* 1923). A typical plant of this species received from the Gardens of the Royal Horticultural Society in England and grown at The New York Botanical Garden is shown in FIGURE 1.

The plants of *H. nana* grow compactly in the crown with short and almost erect branches. Some of the roots become somewhat enlarged and fleshy but, as far as the writer has observed, the fleshy part is at the end of a root and at some distance from the crown. For plants in culture the leaves may be much as 15

FIGURE 1. A plant of *Hemerocallis nana* obtained from the Royal Horticultural Society and grown at The New York Botanical Garden. The six-inch pot gives a measure of the dwarf stature of the plant.

inches long, expanded rather than plicate, and longer than the scapes. The scapes are slender, bending outward, and usually they bear one flower. When there is more than one flower the scape is branched. The bracts are inconspicuous and often there will be two to a scape, even though there is but one flower. The flowers may have a spread of three or more inches; the segments are rather narrow; the tube short and not sharply defined; the color on the inner face is a clear orange, but on the reverse there may be shades of reddish-brown.

The photograph taken by Forrest and his herbarium material show plants with rather sparse foliage and short scapes. The same is true of specimens collected by J. F. Rock (his Nos. 5231 and 9593) collected in 1922 and 1923 in Yunnan, which appear to be *H. nana*. (See FIGURE 2.) In the herbarium specimens the leaves seem decidedly plicate, the tips of the leaves are often broken, and in the specimen collected by Forrest (FIGURE 2) which the writer

has seen the tips of the leaves were evidently removed by some animal with the result that they appear to be shorter than the scapes. In comparison with these, the plants of this species grown in pots at The New York Botanical Garden (see FIGURE 1) are larger with longer and broader leaves that are not plicate. It is to be expected that the plants which are grown in gardens or in pot culture will be taller and more lush than those plants which grow in the wild and especially when they are on poor soil in dry and rocky habitats.

This species somewhat resembles the *H. Dumortierii* in habits of growth and character of the flowers, but is less robust, the bracts are less conspicuous, and the scapes are, when more than one-flowered, decidedly branched.

FIGURE 2. At left: Photograph of an herbarium specimen evidently of *Hemerocallis nana* collected in 1922 by J. F. Rock (No. 5231) on the eastern slope of the Likiang Snow Range, Yangtze watershed, Yunnan, China. At right: Photograph of an herbarium specimen of *H. nana* collected by George Forrest (No. 20424) in 1911 in northeast Yunnan, China.

Hemerocallis plicata. The *H. plicata* was first described by Stapf (Bot. Mag. 148: *pl. 8968.* 1923) as different from *H. nana* chiefly in having usually folded or plicate leaves and a more branched inflorescence. An herbarium number (Mengtse, Henry 9497), a sheet of which is now at The New York Botanical Garden, was cited in the original description as belonging to this species. This specimen shows a branched scape about 10 inches long bearing as many as four flowers and extending above the foliage. Living plants obtained in 1929 from Great Britain as *Hemerocallis plicata* were evidently *H. nana,* for the scapes were shorter than the leaves and only one- or two-flowered. Later, in 1933, plants of this specific name, also from stock in cultivation in Great Britain, had slender scapes 16 inches long that extended well above the leaves and bore as many as eight flowers in a much-branched inflorescence. The flowers had a faint but distinct halo of fulvous color in the face of both petals or sepals. The capsules produced were decidedly three-sided and tapered to an acute point. It is not clear what the valid distinctions of this so-called species are.

Hemerocallis Forrestii. This species was first described in 1912 (Notes Roy. Bot. Gard. Edinburgh **5**: 298. 1912) from material collected by Forrest in 1906 on the eastern flank of the Lichiang Range in China. The first description stated that the plants grew to a height of 18 inches and had flowers reddish-orange in color, and that the species is to be regarded as related to the *H. fulva.* There has, however, been no trace of fulvous coloring in the flowers of plants received as *H. Forrestii* at The New York Botanical Garden, a typical plant of which was illustrated in color in *Addisonia* (**15**: *pl. 381*). As far as the writer can judge, this species is more robust than the *H. nana* and the scapes are usually several-flowered.

The so-called H. fulva angustifolia. A daylily that was considered to be a dwarf variety of *H. fulva* was described by Baker in 1871 (Jour. Linn. Soc. **11**: 359). This plant was described as having scapes scarcely a foot tall and leaves only 12 to 18 inches long. The description was based on herbarium specimens collected at Khasia, India, from Guriev near the the northwestern side of the Caspian Sea, and from Karabagh in Caucasia. There is no definite evidence that the color of the flowers was fulvous and it seems very probable that these collections are of plants very closely

related to the *H. nana.* No living plants or seeds of the daylilies in these localities have, apparently, ever reached Europe or America for culture.

A Dwarf Clon Resembling Hemerocallis Dumortierii. A plant which is indeed dwarf was received by the writer several years ago

FIGURE 3. A plant standing less than a foot tall, as is indicated by the six-inch rule. Apparently a dwarf type of *H. Dumortierii.*

under the name *Hemerocallis graminea* but this is either a somewhat aberrant plant of *H. Dumorticrii* or a hybrid with this species as one parent. FIGURE 3 shows the habit of this plant and the six-inch rule set upright in the plant shows the dwarf size. The foliage is slender and about 15 inches long. The scapes are about a foot long, slender, drooping and usually the 2 or 3 flowers of a scape are in a compact cluster. The plant closely resembles *H. Dumortierii* but is more dwarf, and the roots are less fleshy than the type commonly seen in culture or obtained from the wild. The plant shown in FIGURE 3 has been grown for eight years without division.

This plant has been hybridized with various daylilies and especially with *H. nana* and the seedlings are now being grown in the hope that desirable dwarf plants will be obtained.

Hemerocallis minor. Plants of this species have slender leaves of low-growing stature but the scapes rise well above the leaves and hence the plants are perhaps to be classed as semi-dwarf rather than dwarf. There are at least several clons of this type in cultivation under the names *H. graminea* and *H. gracilis,* which differ in stature, but those which the writer has seen are not as dwarf as the *H. nana.*

Numerous plants, possibly to be included with the species *Hemerocallis minor,* are now being grown at The New York Botanical Garden from seeds collected from wild plants in China. There is much variation in stature and some individuals have dwarf and low-growing foliage with, however, taller scapes.

These types have yellow flowers; most of them bloom rather early in spring and none of them thus far observed possesses outstanding merit in regard to charm and abundance of flowers. Yet they are of some value for culture, especially in rock gardens.

Horticultural Clons Described as Dwarf. Several horticultural clons of daylilies are described as dwarf but it is not at all certain that any of these is to be classed as truly dwarf.

The clon DWARF YELLOW grows to a height of over 30 inches. Mr. George Yeld in England has reported two hybrids with *H. flava* and *H. nana* as parents that are said to be "dwarf." These have been given the horticultural names MINIKEN and MOIDORE and in due time may be available in the trade. The clon PERRY'S PIGMY is described as reaching a height of at least 18 inches. Horticultural literature contains occasional references to other varieties that are called "dwarf" but as far as the writer knows, the plants mentioned will reach a stature that can scarcely be classed as dwarf. An excellent variety, TANGERINE, which reaches a height of about 18 inches, is the smallest of the older and well-known clons of cultivated daylilies.

Seedlings in daylilies have a habit of flowering in the first few years of growth while they are relatively low in stature, but as the plants become older and better established the scapes and foliage increase in stature to the normal maximum for each. This is also true of plants grown from divisions.

Seedlings. Selective breeding by the author for the development of dwarf daylilies has given a considerable number of plants of special interest.

A total of 74 hybrids of *Hemerocallis flava* × *H. nana* have been grown to full maturity. These plants are very uniform in character. The erect scapes rise to a height of 30 inches and bear 1 to 4 flowers. They resemble the *H. flava* rather strongly but the flowers are darker and more orange but less full and the scapes are less branched. These plants are decidedly impotent; the pollen is almost all aborted and no seeds have yet been obtained to numerous self- and cross-pollinations; hence a second generation has thus far not been obtained. The plants are not dwarf and they are of no special merit for culture in comparison with such clonal varieties as SOVEREIGN and GOLD DUST.

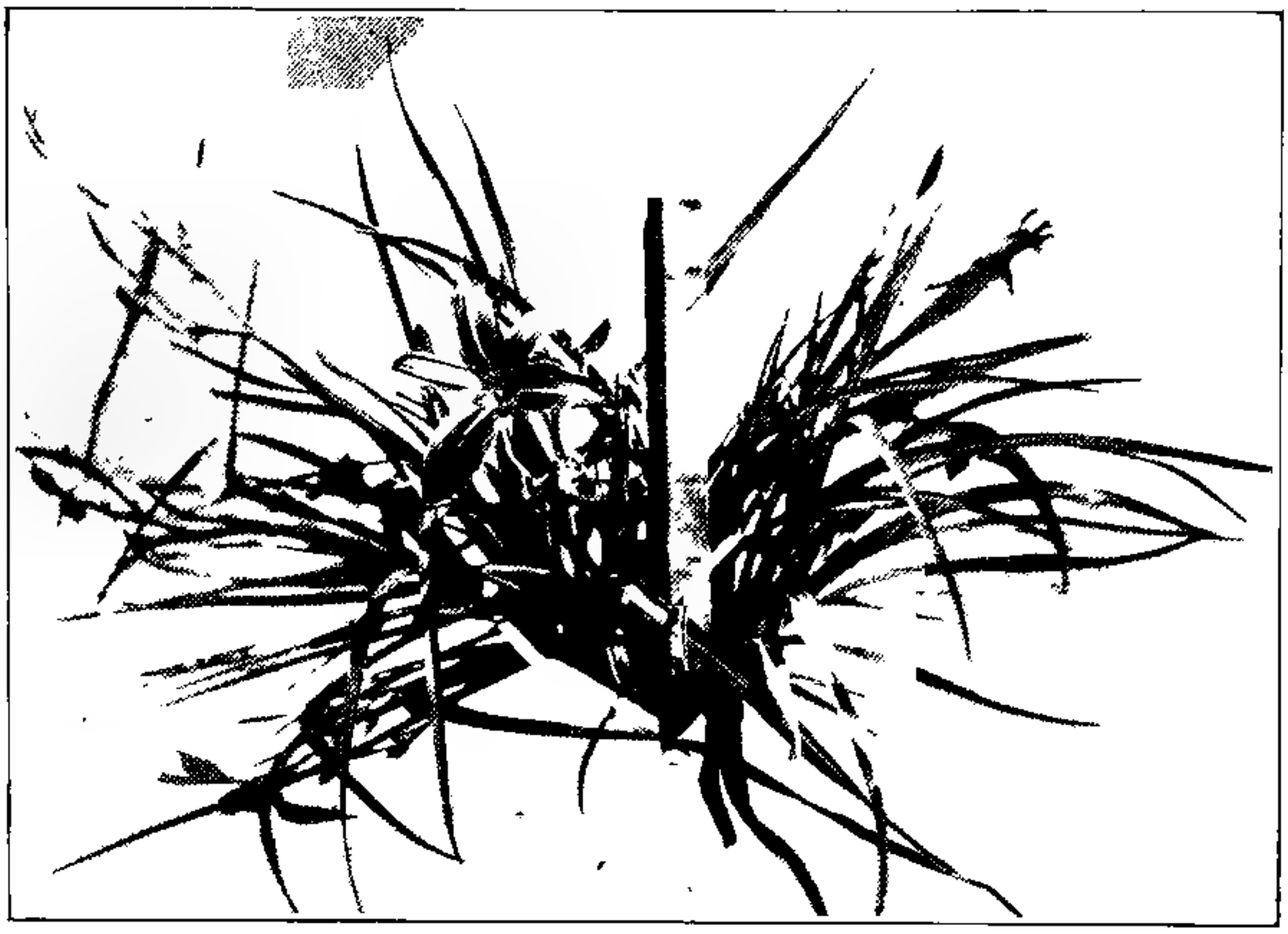

FIGURE 4. Hybrid having as seed parent *H. nana* crossed with a red-flowered seedling. The plant stands about one foot tall, as shown by the foot rule. This plant is being propagated under the name "NADA daylily."

A few seeds were obtained from a plant of *Hemerocallis nana* with pollen of a hybrid selected for dark red colors in the flower. The four seedlings grown are now three years old; the foliage and scapes (see FIGURE 4) bend low and the plants stand scarcely a foot tall. The flowers are rather large (about 4½ inches in spread) and of rich Morocco-red and claret-brown colors, not only in the

face of the flowers but also on the back of the petals. These plants set no seed to any of the many pollinations that were made. The seedling shown in FIGURE 4 is being propagated under the name NADA daylily.

Numerous seedlings from various hybridizations involving plants of *H. nana, H. plicata,* and *H. Forrestii* are being grown which have not yet flowered.

Dwarf plants have frequently appeared among the seedling daylilies reared from parents that are semi-dwarf or even robust. Some of these, which are now about ten years old, have small slender leaves less than a foot long but no flowers have been produced. Others that stand about 18 inches tall are rather attractive plants and are perhaps worthy of culture provided better seedlings are not obtained in this semi-dwarf stature. Several such plants are now being propagated.

Conclusion: The wild dwarf daylilies, and especially plants of *Hemerocallis nana,* discovered in southwestern China, are without doubt worthy of a more general trial in gardens of America. These daylilies should, it would seem, be welcome additions to the rock garden. Surely in various parts in the United States conditions will be suitable for their culture. Daylilies of dwarf stature also exist as variants in the species *H. Dumortierii* and *H. minor* and they also appear among seedlings of more robust parents. Some of these are worthy of garden culture.

These dwarf daylilies should also be of value for further hybridization and selective breeding in the development of dwarf or semi-dwarf clons comparable in flowering habits and flower colors to the best of the more robust clons now available for garden culture. A beginning has already been made in the production of such clons.

A. B. STOUT.

9

DYED, GILDED, AND SILVERED DECORATIVES

The increasing amount and variety of artificially colored plants or parts of plants that are used for decoration in homes and in public places and shops has brought so many erring guesses as to what these plants are that it seems of interest to give information about their identity. Some of these plants are so altered in appearance by the bleaching and dyeing processes, that questions have arisen over whether they are artificial or natural. All of the plants here mentioned are natural, although some, especially the colored oak-leaves, the branches of *Ruscus, Smilax laurifolius, Eucalyptus polyanthemos,* and some of the grasses, appear artificial.

The Grass Family, Poaceae, to which we are indebted as the source of nearly all our cereals, leads in the number of genera represented. The most beautiful and showy of its members that are used for this purpose is the pampas grass, *Cortaderia argentea,* whose great plumes 1–3 feet long, which are naturally silvery white, are dyed rose, light green, and light blue as well as left natural. This plant is a native of the Argentine Republic, and is grown commonly for decorative effect on large estates and in gardens and parks. A sister genus, *Erianthus,* has several species which are very similar in general appearance to the pampas grass, but are smaller-plumed and less silvery. They are, nevertheless, used in the same manner.

The uva-grass, *Gynerium sagittatum,* often erroneously called pampas grass, to which it is related, is frequently used, dyed in various colors. The staminate flower-spray is 3–5 feet long, with very loose, drooping branches, usually all hanging in one direction, and neither silky nor woolly. The silky pistillate spray is more like that of the pampas grass, and is often mistaken for it. Uva-grass is a native of tropical America.

The common marsh-reed, *Phragmites communis,* which grows in salt or brackish marshes throughout the northern hemisphere, is another commonly used grass. Its 1–2-foot plumes of silvery brown are used natural color, or dyed red, green, blue, or purple.

The genus *Uniola* has two native species frequently used for ornament. The fruiting sprays of *Uniola latifolia* and *Uniola paniculata,* both of which grow in loose-branching, drooping sprays are colored red, blue, silver, or gold.

Two other native species of *Uniola, U. laxa* and *U. longifolia,* which have very small flattened spikelets closely set along the stem and not drooping, are also colored and used.

Several species of sandbur (*Cenchrus*) are used occasionally in bouquets, usually dipped in silver or gold. They grow in spikes 3 or 4 inches long, consisting of numerous spiny burs about the size of a small pea.

The toothache-grass, *Campulosus aromaticus,* is occasionally used in bouquets, dipped in silver or gold or colored. This grass has a comb-shaped spike, sharply bent to one side. It is native in the coastal plain from Virginia southward.

Red-top grass, *Agrostis alba,* whose loosely branched panicle, 3 to 6 inches long, is naturally reddish-tinged, is also dyed various colors or dipped in gold or silver.

Kentucky blue-grass, *Poa pratensis,* a familiar lawn-grass, with a panicle more contracted than that of red-top, is similarly employed.

Orchard grass, *Dactylis glomerata,* which has a much coarser and still more congested panicle, is also used.

Switch-grass, *Panicum virgatum,* very common on Long Island and southern New Jersey in sandy soil, with a loosely branched panicle a foot or more long, is rather frequent in bouquets dyed in colors or metallic hues.

Timothy, *Phleum pratense,* a common grass, whose flower heads look like tiny cattails, is frequently colored red, green, blue, purple, orange, gold, or silver for use in bouquets.

Different species of brome-grass, *Bromus* spp., whose more or less drooping panicles somewhat resemble oats, are similarly treated.

Recently the fruiting stalks of a species of *Xyris* have been used, the ellipsoidal head of the stalk being colored gold, silver, green, red, blue, purple, or yellow, a metallic paint being used for this coloring, which gives the appearance of very long brown-stemmed hatpins with elongated heads. This is a member of the Yellow-eyed Grass Family, Xyridaceae.

The fruiting heads of *Eriocaulon compressum* and *E. decangulare,* both commonly called pipewort, and both resembling flat-headed hatpins, are used in wreaths or bouquets, dyed blue, purple, green, yellow, orange, and rose. These are members of the Pipewort Family, Eriocaulaceae.

The Mustard Family, Brassicaceae, gives three members to our colored clan. The pepper-grass, *Lepidium virginicum,* a common dooryard and waste-place weed, whose horizontally flattened seed-pods stand out like small, stalked fans around the stem, is becoming very common in dried bouquets, for which purpose it is colored yellow, orange, red, blue, violet, green, gold, or silver.

The fruiting stalks of the penny-cress, *Thlaspi arvense,* which are similar to those of pepper-grass but larger, are occasionally used in the same way.

The pride of the mustards, from the standpoint of winter ornament, however, is the honesty, *Lunaria annua,* whose large, silvery-transparent seed disks are a favorite for decoration, and in addition to being used in natural color, are sometimes dyed yellow, pink, red, blue, green, orange, gold, or silver. This plant is a native of Europe, but is an old-fashioned garden flower, and quite easily raised from seed.

Probably at present the most popular subjects in this line are the dried flower-sprays of *Gypsophila paniculata,* or baby's-breath, the double-flowered form being used. This plant is a member of the Pink Family, Caryophyllaceae. The florist shops this winter are full of the small, rounded, loose-branched sprays of this plant, in red, pink, orange, yellow, green, blue, and purple.

The fruiting heads of the familiar wild-carrot or Queen Anne's lace, *Daucus Carota,* are sometimes used, their cupped-up curly-appearing heads being usually dipped in gold or silver.

The entire plant of a species of *Eryngium* with spiny leaves and much branched stems, each branch terminated by an oval spiny head, is often dyed red or blue. This plant is also a member of the Carrot Family. *Eryngium amethystinum,* native of Europe, is the most commonly seen, but other species may be used locally.

Another very popular ornament is the fruit of the lotus, two species being much grown and both probably contributing to the supply. The native *Nelumbo lutea,* which the Indians called yonkapin or water-chinquapin, and the sacred lily of Buddha, *Nelumbo nucifera,* are the two most concerned, although other species may also be used. These large fruits which are shaped like broad, inverted cones, with the flat top penetrated by many irregularly rounded holes in which the nut-like seeds are sunken, are usually dipped in gold or silver. It is the use of these seeds by the Indians as food

which gave the American plant its common name. The Nelumbos are members of the Water-Lily Family.

The opened seed-pods of several species of milkweed (*Asclepias*) are becoming quite popular also, the spindle-shaped pods being painted gold or silver outside, and red, green, blue, purple, or orange inside.

The native everlasting, *Anaphalis margaritacea,* whose round, silvery-white flower-heads often appear dyed red, blue, purple, orange, or yellow, is used in artificial bouquets and in wreaths.

The dried inflorescence of tansy, *Tanacetum vulgare,* a flat-topped, branched cluster of round heads appearing like daisies with the rays missing, are variously colored for bouquets.

The dried flowering branches of several species of *Artemisia,* with tiny rounded heads loosely scattered over the branches, are used in the same way.

A number of species of sea-lavender, the genus *Statice,* appear in everlasting bouquets, their much-branched stems with small, rounded or cup-like flowers and calyces being colored red, blue, yellow, or purple, or dipped in gold or silver.

The inflated seed-pods of species of *Cardiospermum,* the balloon-vine, are also used, colored, gilded, or tinseled. This plant is a member of the Soapberry Family and has seed-pods somewhat resembling the Chinese-lantern plant, but with hard, brown, shot-like seeds in them.

The seed-pods of various species of poppy (*Papaver*), are to be seen at times in bouquets, resembling lotus pods on a smaller scale but without any holes in the top of the radially marked disk.

Our native cattails, *Typha latifolia,* and *T. angustifolia,* so common in swamps and ponds, have their uses, the long brown, candle-like fruiting spikes being quite ornamental and lasting in the natural state, though often they are dipped in gold or silver for those who wish more show.

The seed-pods of various species of *Iris* are used occasionally, being silvered, gilded, or colored for this purpose.

The fruiting spikes of mullein, *Verbascum thapsifolius,* a naturalized weed with rounded seed-pods as large as peas in a close-set spike 8–12 inches long, have been dipped in gold, silver, or bronze for winter decoration.

The seed-pods of aloes, agaves (century plants) and mesem-

bryanthemums (fig-marigolds) may occasionally be made use of, especially on the Pacific Coast, but, not having appeared on the eastern market, they are not described here.

Four large spiny-headed plants are occasionally used: the teasels, *Dipsacus sylvestris* and *D. Fullonum,* of the Teasel Family, with oblong spiny heads and spiny stems; the globe-thistles, *Echinops sphaerocephalus* and *E. Ritro,* of the Thistle Family, with round, spiny heads and smooth stems. These are made various colors or gold or silver and are among the most permanent and attractive of all winter ornaments, lasting for many years.

A fruit ornamental in its natural state is the Chinese-lantern plant, *Physalis Francheti,* whose bright-red, drooping, oval, fruit-calyces are commonly seen in florist shops. These fruits are often dipped in silver or gold for holiday decorations. The plant is easily raised, making a rank growth with inconspicuous flowers, but is worth the space it takes for its showy fruits.

Another ornamental fruit, the soda-apple, *Solanum aculeatissimum,* commonly seen in its natural state, with the wide-spreading branches hung with large bright red berries, which appear like small tomatoes, but satiny in texture, is also dipped in gold or silver for decorative purposes.

The fertile spikes of the sensitive-fern, *Onoclea sensibilis,* which look like a clustered group of strings of beads, growing stiffly upright on a common stalk 8–12 inches long, are gilded or silvered.

Besides these herbaceous plants, portions of a number of trees and shrubs and woody vines are used.

The leafy branches of the incense cedar, *Libocedrus decurrens,* a member of the Pine Family and native of the northwestern coast of North America, a tree with long cedar-like branches, flattened in one plane, are gilded or tinseled for holiday use.

The cone-bearing branches of the red spruce, *Picea rubens,* and the black spruce, *Picea mariana,* both of the Pine Family, are also used, either naturally or dipped in gold or silver. These are placed in bouquets or wreaths and are quite attractive. Sprays of the needles as well as the cones of various species of pine are handled similarly; also sprays of yew (*Taxus*) and juniper (*Juniperus*).

The native alder, *Alnus rugosa,* of the Birch Family, has become quite popular for window decoration. For this purpose, large branches of this shrub are tinseled over, and even though bare of

leaf or fruit, make a fine display. The cone-bearing twigs of this plant are also silvered or gilded.

Long streamers of the evergreen brier, *Smilax laurifolia,* a native woody vine, are dipped in gold or silver or dyed bright green for window and festive indoor decorations.

Recently, the branches of *Eucalyptus polyanthemos,* of the Myrtle Family, an Australian tree grown in California, have been put on the New York market. These branches, with long-stalked, nearly round leaves, with small clusters of flowers or fruits in their axils, or at the ends, are dried and then dipped in gold or silver, in which state they make a splendid addition to our artificially colored decorations.

The large, roughly four-angled seed-capsules of *Eucalyptus Globulus,* which grow in the leaf-axils of the branches, are becoming frequent, but with the leaves stripped off. These are used in their natural steel-gray color or are dipped in gold or silver. Other species of *Eucalyptus* may be similarly used.

The fruiting spikes of species of *Melaleuca* and *Callistemon,* two Australian genera, also of the Myrtle Family, with 3-6-inch spikes of closely set, hard, round capsules, have been seen, dipped in gold or silver.

Oak acorns are sometimes so employed, as also are the hips or "berries" of roses.

A most common winter decoration is the branches or twigs of *Ruscus aculeatus,* the butcher's broom of western Europe. This is a relative of asparagus and smilax, of the Lily Family, and has small stiff, ovate, spine-tipped "leaves" closely crowded on the stem. This plant is occasionally used in its natural color of dark-green, but usually it is bleached, and then dyed red, blue, purple, or emerald-green, gold, or silver, or occasionally the silver covers the other colors, giving the whole a remarkable metallic appearance.

Branches of box, *Buxus sempervirens,* are occasionally used in the same manner. They are very similar in appearance to the butcher's broom, but the leaves are not so thick and stiff, and are rounded at the top instead of tapering to a stiff spine.

The leaves of *Lomatia tinctoria, L. silaifolia,* and *Grevillea robusta,* Australian plants belonging to the Silk-oak Family, Proteaceae, are also used ornamentally, for this purpose being first bleached and then dyed red or blue, gold or silver. The leaves of

these trees are finely cut up into slender, round-tipped or pointed divisions, the portions seen often being mistaken for a fern or seaweed, as they vaguely resemble bladder-wrack, a common seaweed, but are smaller and more slender, lack bladders, and have veins in the divisions.

In addition to the above, two showy fruits are frequently dipped in gold or silver, the drooping rose-colored spikes of the California pepper-tree, *Schinus Molle,* and the dense-clustered, short, stiff, red spikes of the Brazilian pepper-tree, *Schinus terebinthifolius.*

The fruiting sprays of bittersweet, *Celastrus scandens,* are also treated likewise.

One of the most interesting cases is that of oak leaves, usually those of the red, black, and scarlet oak being used. They are subjected to a process which destroys the coloring matter and makes the leaves leathery in texture. They are then dyed in their autumnal colors or in dark-green, and make a lasting decoration.

The small blue-black berries of the privet (*Ligustrum*), are sometimes used in natural colors, or gilded or silvered. This is commonly planted for hedges and, when untrimmed, flowers and fruits freely. Another species with black berries is also frequently planted.

For memorial decorations, wreaths and festive ornaments, the leaves of the sago palm, *Cycas revoluta,* are much used, for this purpose being dyed green, red, blue, or purple, or dipped in gold or silver. This plant, in spite of its palm-like leaves, is not a true palm, but is a member of the Cycad Family, Cycadaceae.

The parasol-like fruits of *Firmiana* (*Sterculia*) *platanifolia* have been seen in a few places. These have the "parasol" divisions separated and the round, hard seeds attached on their edges. Occasionally they are gilded or silvered.

The seed pods of magnolias, large ovoid or ellipsoid cones, may appear occasionally, gilded or silvered. These, while used locally, have not as yet appeared on the market.

A much to be deplored practice is the use of long streamers of ground-pine, various species of *Lycopodium,* for the making of wreaths, used natural color, or bleached and dyed red or green, gold or silver. Since the stems of these plants grow on or just under the surface of the ground, the plants are being rapidly destroyed, as collectors usually exterminate a colony while they are at it. These

plants, which look like miniature spruces, firs, or cedars, are slow-growing when young, and years are required to reëstablish depleted colonies. The rarity of ground-pine on the market this year may indicate either a sad depletion of the supply or the turning of the popular fancy to something else.

Of all the plants mentioned above, the ground-pine, the evergreen brier, and bittersweet are the only ones in need of protection, as the others are either weeds, cultivated plants, or free-seeding plants which rapidly reëstablish themselves.

EDWARD J. ALEXANDER.

EXHIBIT OF AQUATIC PLANTS AT GARDEN

Suitable plants for home aquaria are the feature of a special exhibit now in progress at The New York Botanical Garden.

Twenty tanks, containing both native and tropical plants in great variety, besides a small number of fish, comprise the display, which is in the Museum Building. It is believed to be the first exhibition of its kind ever given in the United States, and has been arranged in response to the great public interest at present in aquaria in homes.

Because rare water plants as well as the more commonly used ones are being shown, the exhibit is exciting interest and drawing visitors from a wide field. A specimen of the much-prized, delicate Madagascar lace-plant holds the center of the stage in a specially lighted tank.

Different combinations of aquatic vegetation are being shown, and each species is labeled with the correct botanical name and the place of its native origin, with a special view to aiding people seeking ideas for their own aquaria.

Material for the exhibit, which is expected to last about three months, is being contributed by numerous growers and private collectors of aquatic plants.

NATIVE IRIS NOTES—I

I. On the Relative Vitality of Louisiana Iris

In one of the temporary plantations of Gulf State irises at the Botanical Garden, differences in the vitality of various specimens were very evident during the past season.

An opportunity was afforded to observe the relative growth of the plants over a period of two years in a temporary nursery where the plants were set out in rows as they were received from the field in the spring of 1931. The rootstocks were planted in rows, so many of each accession number being preceded by a record label. The nursery rows were separated by foot-paths and there was considerable walking between the rows of plants. The plants grew vigorously. The majority, moreover, remained within their intended bounds. However, notwithstanding the tramping in the paths, the plants of several species grew with such vigor that the rootstocks not only mingled densely in their own allotted space, but grew across the paths on either side and mingled so intimately with those of their neighbors that it was in many cases impossible to separate the two with confidence. The worst "sinners" so to speak were: *Iris vinicolor, I. oenantha, I. fourchiana,* and some varieties of *Iris giganticaerulea.*

II. Autumn Flowering of Louisiana Iris

Some recent performances among the Louisiana irises may give heart to those who are seeking for a race of autumn-flowering irises. In one of our plantations of irises set out with plants from the temporary nursery referred to above, in the summer of 1932, an interesting phenomenon was observed. About a month after the regular flowering season—June—the plants of several numbers of the irises collected prior to 1931 began to flower. From the first week in August to the last week in September, normal flower-stalks two and a half to three and a half feet tall appeared. With one exception they were pink- or red-flowered species. Some of the stalks bore as many as nine flowers, and many of the flowers were exceptionally fine. Will these plants repeat this routine next year? Unfortunately the late-flowering period did not permit of the ripening of the seeds. The plants under the following Garden accession numbers flowered in the two autumn months: Numbers

62751, 62753, 62761, 62791, 62878, 62879, 62913, 62924, 62925, 62945, 62961, 62997, 62999. Iris-growers who may see this note and have received plants of the numbers cited here may be interested in watching their autumn behavior. We have no assurance that these plants will repeat their fall program next year, but we shall await the time with interest.

JOHN K. SMALL.

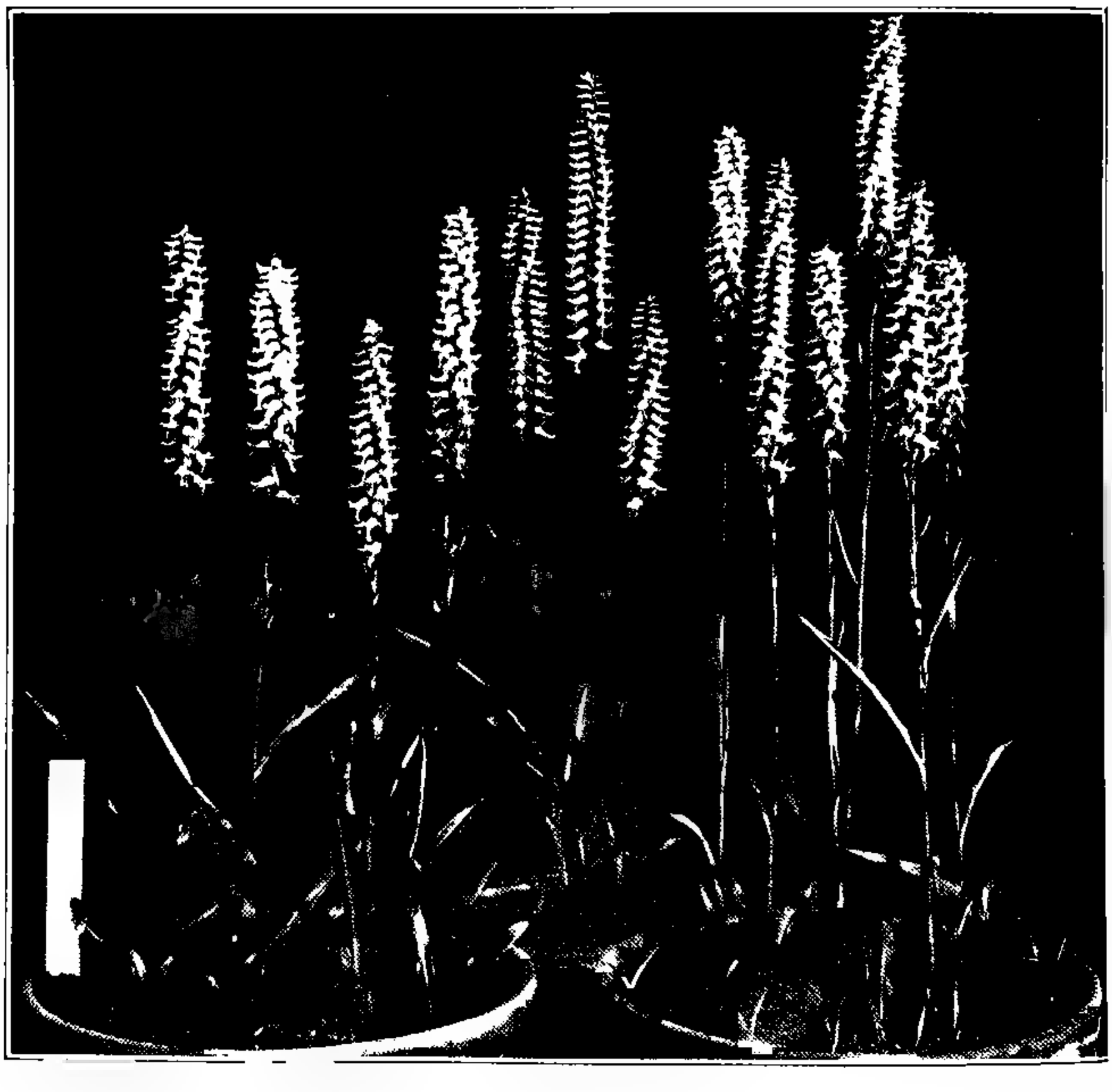

FIGURE 1. Specimens of *Ibidium odoratum* which flowered at The New York Botanical Garden last fall. Forty-two suckers were produced by these 14 plants.

ORNAMENTAL LADIES'-TRESSES

Last year (Jour. N. Y. Bot. Gard. **34**: 106–108), I published a note on "Our Largest Ladies'-Tresses," *Ibidium odoratum*. The subject of the note was a young plant brought to the Garden from New Orleans, La. It flowered last fall and made three "suckers" which were transferred to a pan. In the meantime Mr. J. B. Wallace, of New Orleans, sent twelve young plants to the Garden. These were set out, six each in two large pans. Eleven of the new plants grew and flowered along with the three descendants of the single plant that flowered in the fall of 1932. The plants began to open their flowers the first week in September and continued to flower until the first week in November (FIGURE 1).

In addition to the long flowering-season this autumn, two other interesting features were evident. I.—Seven of the flowering-spikes had a clockwise twist, while seven others had a counter clockwise twist. II.—The fourteen separate plants have produced forty-two "suckers." This indicates forty-two flower-spikes for next fall's growth, or three new plants apiece for each plant now flowering, just as the single plant last fall made three new plants for this year's growth. For a plant accustomed to the normal soil and fresh air of a southern swamp this plant shows remarkable vigor when grown under glass in the North. Several of the flower-stalks now measure more than two feet in height. One of the flower-spikes is nine inches long as against the one six inches long referred to in the note mentioned at the beginning of this note.

JOHN K. SMALL.

CONFERENCE NOTES FOR DECEMBER

A conference of the Scientific Staff and Registered Students of the Garden was held on the afternoon of December 13.

Dr. Marshall A. Howe discussed "*Riccia* in the Galapagos Islands," with reference to a considerable number of specimens of this genus collected on these islands in 1932 by Mr. John Thomas Howell, botanist of the Templeton Crocker Expedition of the California Academy of Sciences. Although short lists of the Hepaticae

of the Galapagos Islands have been published, the only reference to a *Riccia* occurs in Dr. B. L. Robinson's "Flora of the Galapagos Islands" in which Professor Alexander W. Evans mentions a specimen from Chatham Island as "sterile and indeterminable." In the material collected by Mr. Howell, three species are represented. Two, closely allied to West Indian species but distinguishable, are being proposed as new. One of them, somewhat variable, is represented by eleven specimens from five islands: the other is based on a single collection on Chatham Island. A few specimens of Anthocerotaceae from the Galapagos Islands and Cocos Island and species of *Riccia* collected by the Templeton Crocker Expedition in Costa Rica and Lower California and outlying islands were also discussed.

Under the title of "Mycological Notes," Dr. Fred J. Seaver directed attention to a number of interesting fungi which have recently come to hand. Among these was a rare phalloid, *Anthurus borealis,* collected by Dr. A. B. Stout in a spent hot frame in the Botanical Garden, a species described by Dr. E. A. Burt in 1894. While it has been collected occasionally in the eastern United States, it belongs to a genus which is essentially tropical. There is only one other record of its having been collected in The New York Botanical Garden. In October, 1919, Mr. Kenneth R. Boynton made a collection of this species in a gladiolus bed as noted by Dr. Murrill in *Mycologia* for 1920.

This was contrasted with another rare phalloid, *Colus javanicus,* which was collected over several seasons in a limited area in The New York Botanical Garden and is known from only one other locality in continental North America. An account of this was published in *Mycologia* (23: 83. 1931). While it is recognized that many of the fungi are cosmopolitan in the same latitude throughout the world, the tropical species are thought to be rather exclusive. The occurrence of two supposedly tropical forms in The New York Botanical Garden is therefore of unusual interest.

Dr. Seaver devoted most of his time to a review of his work on North American cup-fungi, directing attention to a number of interesting forms and additional information on recorded forms which has been accumulated since the publication of his first vol-

ume, North American Cup-fungi (Operculates), in December, 1928. The talk was illustrated with numerous photographs and sketches.

A. B. STOUT,
Secretary of the Conference.

A GLANCE AT CURRENT LITERATURE[1]

In a report of recent studies in plant propagation conducted by the Agricultural Experiment Station at Cornell University, L. C. Chadwick describes the influence of chemicals, of the medium, and of the position of the basal cut on the rooting of evergreen and deciduous cuttings. Valuable tables and diagrams relating to a large number of different species and the manner of treating them are given in the paper, which has been issued as *Bulletin 571*.

* * * *

Readers of the *Gardeners' Chronicle* for December 9 will be envious of Lady Londonderry, in whose garden at Mt. Stewart, Ireland, is a large bed of *Meconopsis violacea*. The plants, the first of which were found in Upper Burma by F. Kingdon Ward, are growing three and a half feet high and blooming with an abundance of large violet-colored flowers with orange anthers. They are reported to be seeding themselves freely, and seem successfully established in their new home.

* * * *

The 1933 *Lily Year Book* published by the Royal Horticultural Society of London, contains an article by Dr. A. B. Stout, of The New York Botanical Garden, in which are summed up the present results of his work in the study of sterility in lilies. He describes different types of sterility and lists cases of interspecific sterility and fertility among lilies. The paper is followed by a report of the discussion which took place when it was read at a London meeting.

* * * *

"When Winter Comes to the Garden" is the subject of an inter-

[1] All publications mentioned here—and many others are to be found in the Library of The New York Botanical Garden, in the Museum Building.

esting and practical article in *Horticulture* for November 15. In the same issue, John C. Wister describes certain notable gardens of the East under the title "Where the Country's Finest Lilacs Grow."

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A brief story of an unusually interesting herb garden is told among other garden tales in the November *Bulletin of the Garden Club of America*. Dorothy E. Pletcher also writes of herb gardens in the December *Nature Magazine*.

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The Orchid Review for November includes "Sick Orchids: Some Causes and Cures" by B. Hills, of Exbury, a grower with thirty years of practical experience in raising orchids.

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An all-American selection of annuals described in the December 1 issue of *Horticulture* includes a giant Scabiosa with curled petals, Pink Gem variety of *Petunia nana compacta*, the annual chrysanthemum known as Eldorado, the aster Los Angeles, and Hunnemannia Sunlight.

* * * *

How foresters are growing trees on the mid-western prairies, where nature for thousands of years has failed, is told by Clyde M. Brundy in the December number of *American Forests*.

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New terms that are becoming accepted in genetics, but which have not yet appeared in any dictionaries, are being published in a glossary on the inside back cover of the *Journal of Heredity*, beginning with the October number.

* * * *

The fourth number of *Brittonia*, a series of botanical papers, principally systematic and geographical, being published by The New York Botanical Garden, appeared last month. It contains descriptions and discussions by A. C. Seward, of Cambridge, England, and by E. D. Merrill and Albert C. Smith, of The New York Botanical Garden.

* * * *

New books lately acquired by the Botanical Garden Library include a number of volumes on gardening and entomology. H. Stuart Ortloff gives special attention to design in his work on "In-

formal Gardens." "The Principles of Plant Culture" is the subject of E. S. Goff. Edward Oliver Essig has written "A History of Entomology," K. M. Smith "Agricultural Entomology," and John Percival "Agricultural Bacteriology," all of which are now in the Library. Volume III of The Ferns, in the Cambridge Botanical Handbooks, deals with Leptosporangiate ferns. F. O. Bower is the author.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

At the annual meetings held in Cambridge, Massachusetts, in the last week of December, Dr. E. D. Merrill was elected President of the Botanical Society of America, and Dr. B. O. Dodge was elected Vice-president of the American Association for the Advancement of Science and Chairman of its Section G (Botany). Members of the Botanical Garden staff attending the meetings were, in addition to Dr. Dodge, Dr. Marshall A. Howe, who presented a paper on "A marine-algal reef in the mountains of California"; Dr. H. A. Gleason, who continues as Treasurer of the Botanical Society of America; Dr. F. J. Seaver, who continues as Managing Editor and Editor-in-Chief of *Mycologia,* now the official organ of the Mycological Society of America; Dr. Forman T. McLean, and Mr. Harold N. Moldenke. Miss Alice Aronescu, graduate student, presented a paper on "*Diplocarpon rosae*: From spore germination to haustorium formation."

Dr. B. O. Dodge was a speaker at the fall meeting of the Society for the Study of Asthma and Allied Conditions, held in New York December 9. His subject was "Common Molds." Also on the program was Dr. J. Gardner Hopkins, of Columbia University. Discussion followed both addresses.

Mr. Knowles A. Ryerson has been appointed Chief of the Bureau of Plant Industry of the U. S. Dept. of Agriculture, in succession to Dr. W. A. Taylor, retired. Mr. Frederick D. Richey becomes Associate Chief and Dr. Karl F. Kellerman, formerly Associate Chief, becomes head of a new Division of Plant Disease Eradication and Control in the Bureau of Entomology. This divi-

sion will have transferred to it all activities directed towards the control and eradication of the "phony peach" disease, blister rust, barberry, citrus canker, and Dutch elm-disease.

Dr. Marshall A. Howe, Assistant Director, was elected President of The New York Academy of Sciences at the 116th annual meeting of the Academy, held at the Biltmore the evening of December 18. Dr. E. D. Merrill, Director-in-Chief, was elected a Councilor.

In the November issue of this JOURNAL (p. 247), in the list of enrolled students in the gardening courses, Mr. Thomas W. Little was erroneously referred to as connected with the "Charles Montgomery Estate." It should have been the Robert H. Montgomery Estate at Cos Cob, Connecticut.

In addition to the members of the Ninth National Shade Tree Conference held at the Garden, September 7–9, 1933, the following visiting botanists have enrolled in the library during the autumn: Dr. Ivan M. Johnston, Jamaica Plain, Mass.; Dr. Glen Gardner Hahn, New Haven, Conn.; Dr. E. H. Eames, Bridgeport, Conn.; Prof. L. H. Bailey, Ithaca, N. Y.; Mr. Edwin B. Bartram, Bushkill, Pa.; Mr. R. Kent Beattie and Mr. Curtis May, Washington, D. C.; Dr. Carlos A. Marelli, La Plata, Argentina; Dr. Albert S. Müller, Viçosa, Brazil; Mr. Harvey M. Bassler, Iquitos, Peru; M. Armand Renier, Brussels, Belgium; Dr. H. J. Lam, Leiden, Holland; and Dr. Yonosuke Okada, Sendai, Japan.

"Still pursuing his theory that blight-resistant native American chestnut trees may be developed through the encouragement of sprouts that have appeared since the blight swept most of the trees away, Dr. John Stuart Thomson, of 361 Bergen Avenue, Jersey City, N. J., again calls for voluntary coöperation in an attempt to restore this tree to its former glory. Dr. Thomson is convinced that progressive immunity can be built up for the chestnut tree and has conducted many experiments in support of his conviction. What he wishes is to hear promptly from individuals who find nut-bearing sprouts or new trees bearing burs."—[*Nature Magazine* 20: 94. 1933.]

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GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a beautiful rose garden, a rock garden of rock-loving plants, and fern and herbaceous gardens.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of narcissi, daffodils, tulips, lilacs, irises, peonies, roses, lilies, water-lilies, gladioli, dahlias, and chrysanthemums; in the winter displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 43,400 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be sent to

THE NEW YORK BOTANICAL GARDEN
BRONX PARK, NEW YORK, N. Y.

VOL. XXXV FEBRUARY, 1934 No. 410

JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

ACT OF INCORPORATION OF THE NEW YORK BOTANICAL GARDEN (AS AMENDED, 1933)

PROVISIONS OF THE CHARTER OF THE CITY OF NEW YORK FOR MAINTENANCE (AS AMENDED, 1933)

CONSTITUTION AND BY-LAWS (AS REVISED, 1934)

MYCOLOGIA ENDOWMENT FUND

CONSERVATORY RANGE NO. I, AS SEEN FROM THE AIR

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THE NEW YORK BOTANICAL GARDEN

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JOURNAL
OF
The New York Botanical Garden

VOL. XXXV FEBRUARY, 1934 NO. 410

ACT OF INCORPORATION OF THE NEW YORK BOTANICAL GARDEN, AS AMENDED, 1933*

CHAPTER 285, LAWS OF 1891 OF THE STATE OF NEW YORK, AS AMENDED BY CHAPTER 574 OF THE LAWS OF 1893, CHAPTER 103 OF THE LAWS OF 1894, CHAPTER 717 OF THE LAWS OF 1896, CHAPTER 473 OF THE LAWS OF 1914, AND CHAPTER 611 OF THE LAWS OF 1933

AN ACT to provide for the establishment of a botanic garden and museum and arboretum, in Bronx Park, in the City of New York, and to incorporate The New York Botanical Garden for carrying on the same.

Approved by the Governor April 28, 1891. Passed, three-fifths being present.

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

The Corporation

1. Seth Low, Charles P. Daly, John S. Newberry, Charles A. Dana, Addison Brown, Parke Godwin, Henry C. Potter, Charles Butler, Hugh J. Grant, Edward Cooper, Cornelius Vanderbilt, Nathaniel L. Britton, Morris K. Jesup, J. Pierpont Morgan, Andrew Carnegie, Thomas F. Gilroy, Eugene Kelly, Junior, Richard T. Auchmuty, D. O. Mills, Charles F. Chandler, Louis Fitzgerald, Theodore W. Myers, William C. Schermerhorn, Oswald Ottendorfer, Albert Gallup, Timothy F. Allen, Henry R. Hoyt, William G. Choate, William H. Draper, John S. Kennedy, Jesse Seligman, William L. Brown, David Lydig, William E. Dodge, James A.

* Effective on approval by Governor Lehman, April 29, 1933.

Scrymser, Samuel Sloan, William H. Robertson, Stephen P. Nash, Richard W. Gilder, Thomas Hogg, Nelson Smith, Samuel W. Fairchild, Robert Maclay, William H. S. Wood, George M. Olcott, Charles F. Cox, James R. Pitcher, Percy R. Pyne; and such persons as are now, or may hereafter be, associated with them, and their successors, are hereby constituted and created a body corporate by the name of The New York Botanical Garden, to be located in the City of New York, for the purpose of establishing and maintaining a botanical garden and museum and arboretum therein and elsewhere within or without the State of New York, for the collection and culture of plants, flowers, shrubs, and trees, the advancement of botanical science and knowledge and the prosecution of original researches therein and in kindred subjects, for affording instruction in the same, for the prosecution and exhibition of ornamental and decorative horticulture and gardening, and for the entertainment, recreation, and instruction of the people.

Purposes of the Garden

Powers of the Corporation

2. Said corporation shall have all such corporate powers, and may take and hold by gift, grant or devise or by purchase or exchange all such real and personal property as may be necessary and proper for carrying out the purposes aforesaid, and for the endowment of the same, or any branch thereof, by adequate funds therefor. Said corporation may sell or exchange or otherwise dispose of any of its real or personal property.

3. Said corporation may adopt a constitution and by-laws; make rules and regulations for the transaction of its business, the admission, suspension and expulsion of the associate members of said corporation, and for the number, election, terms, and duties of its officers, subject to the provision of this act; and may from time to time alter or modify its constitution, by-laws, rules, and regulations, and shall be subject to the provisions of Title 3, of Chapter 18, of the first part of the Revised Statutes.

4. The affairs of the said corporation shall be man- **Board of Managers**
ged and controlled by a Board of Managers which
all consist of the Mayor of the City of New York, the
resident of the Board of Commissioners of the De-
artment of Public Parks, the President of the Board
f Education of the City of New York, and their suc-
essors in office, one person to be appointed by the
orrey Botanical Club, not more than four persons to
e appointed by Columbia University in the City of
ew York, and at least nine other managers to be
ected by the members of the corporation. The first
ection shall be by ballot and held on a written notice
f ten days, addressed by mail to each of the above-
amed incorporators, stating the time and place of elec-
on, and signed by at least five incorporators. Three of
ie managers so elected shall hold office for one year,
ree for two years, and three for three years. The
rm of office of the managers elected after the first
ection, save those elected to fill vacancies in unexpired
rms, shall be three years. The number of elective
anagers may be increased from time to time by vote
f the corporation. The managers who may be ap-
ointed by Columbia University in the City of New
ork and the manager who may be appointed by the
orrey Botanical Club may be appointed for definite
rms or for indefinite terms, but each such manager
fter any such appointment shall be subject to removal
y said university or by said botanical club, as the case
ay be. The Board of Managers shall elect from their
umber a President, Secretary, and Treasurer, none of **Officers**
hom, or of the Board of Managers, save the Secretary
nd Treasurer, shall receive any compensation for his
rvices as such officer or manager. The Board of
Managers may appoint one or more committees from its
wn membership and give such committee or commit-
es such powers as the Board of Managers may deter-
ine from time to time. Nine corporators shall con- **Quorum of Corporation**
itute a quorum at any meeting of the incorporators;
ut a less number may adjourn.

Original Endowment

5. Whenever the said corporation shall have raised, or secured by subscription, a sum sufficient in the judgment of the Board of Commissioners of the Department of Public Parks in the City of New York, for successfully establishing and prosecuting the objects aforesaid, not less, however, than two hundred and fifty thousand dollars within seven years from the passage of this act, the said Board of Commissioners is hereby authorized and directed to set apart and appropriate upon such conditions as to the said Board may seem expedient, a portion of the Bronx Park, or of such other of the public parks in the City of New York north of the Harlem River in charge of the said Department of Parks as may be mutually agreed upon between the said Board of Commissioners and the Board of Managers of said corporation in lieu of Bronx Park, not exceeding two hundred and fifty acres, for establishing and maintaining therein by the said corporation a botanical garden and museum, including an herbarium and arboretum, and for the general purposes stated in the first section of this act. And the said Board of Commissioners is thereupon hereby authorized and directed to construct and equip within the said grounds so allotted, according to plans approved by them and by said Board of Managers, a suitable fire-proof building for such botanical museum and herbarium, with lecture rooms and laboratories for instruction, together with other suitable buildings for the care and culture of tender or other plants, indigenous or exotic, at an aggregate cost not exceeding the bonds hereinafter authorized to be issued by the City of New York; the use of said buildings upon completion to be transferred to said corporation for the purposes stated in this act. And for the purpose of providing means therefor, it shall be the duty of the Comptroller of the City of New York, upon being thereto requested by said Commissioners, and upon being authorized thereto by the Board of Estimate and Apportionment, to issue and sell at not less than their par value bonds or stock of the Mayor, Aldermen, and

Grounds, Bronx Park

Buildings

Commonalty of the City of New York, in the manner now provided by law, payable from taxation, aggregating the sum of five hundred thousand dollars, bearing interest at a rate not exceeding three and one-half per centum per annum, and to be redeemed within a period of time not longer than thirty years from the date of their issue.

Power of City to appropriate additional land

5-a. The Board of Estimate and Apportionment of the City of New York may, in its discretion, set apart and appropriate, upon such conditions as it may deem expedient, for the extension and development of the work and objects of the said New York Botanical Garden, the whole or any part of that portion of Bronx Park in the City of New York situated between the southern boundary of the land in Bronx Park heretofore appropriated for the use of the said New York Botanical Garden by the Board of Commissioners of the Department of Public Parks, and the northern side of Pelham Avenue; the land so to be appropriated to be described more particularly in the Board of Estimate and Apportionment hereby authorized. (Chapter 473, Laws of 1914.)

Restrictions in use of grounds

6. The grounds set apart, as above provided, shall be used for no other purposes than authorized by this act, and no intoxicating liquors shall be sold or allowed thereon. For police purposes and for the maintenance of proper roads and walks, the said grounds shall remain subject at all times to the control of the said Board of Commissioners of the Department of Parks; but otherwise, after the suitable laying out of the same and the construction of proper roads and walks therein by the Department of Parks, the said grounds and buildings shall be under the management and control of the said corporation. The said grounds shall be open and free to the public daily, including Sundays, subject to such restrictions only as to hours as the proper care, culture and preservation of the said garden may require; and its educational and scientific privileges shall be open to all alike, male and female, upon such necessary regu-

lations, terms and conditions as shall be prescribed by the managers of those departments.

7. This act shall take effect immediately.

PROVISIONS OF THE CHARTER OF THE CITY OF NEW YORK FOR MAINTENANCE (AS AMENDED, 1933)

§ 613. It shall be the duty of the commissioner for the borough of Manhattan to maintain the meteorological and astronomical observatory, the Museum of Natural History, the Metropolitan Museum of Art in Central Park, the Aquarium in Battery Place, and such other buildings as now are or may hereafter be erected in such parks or in any other park, square or public place under his jurisdiction by authority of the board of aldermen. It shall be the duty of the commissioner for the borough of Brooklyn to maintain the Brooklyn Institute of Arts and Sciences, and such other buildings as now are or may hereafter be erected in any park, square or public place under his jurisdiction by authority of the board of aldermen. It shall be the duty of the commissioner for the borough of The Bronx to maintain The New York Botanical Garden and the buildings appurtenant thereto, and such other institutions or buildings as may be established or erected in any park, square or public place in his jurisdiction by authority of the board of aldermen. It shall be the duty of the commissioner for the borough of Queens to maintain such institutions and buildings as now are or may hereafter be erected in any park, square or public place under his jurisdiction by authority of the board of aldermen. It shall be the duty of the several commissioners to provide the necessary instruments, furniture, and equipments for the several buildings and institutions within their respective jurisdictions, and, with the authority of the board of aldermen, to develop and improve the same, and to erect additional buildings; but the maintenance of all such buildings and institutions shall be subject to the provisions of the acts incorporating said institutions, or either of them, and the acts amendatory thereof, and to the powers of said corporations thereunder, and of the boards by such acts created or provided for; and shall also be subject to and in conformity with such contracts and agreements as have heretofore been made with such institutions respectively,

and are in force and effect when this act takes effect, or as may be hereafter made by the authority of the board of aldermen, and no moneys shall be expended for such purposes unless an appropriation therefor has been made by the board of estimate and apportionment and the board of aldermen. Out of the moneys annually appropriated for the maintenance of parks each commissioner may apply such sum as shall be fixed by the board of estimate and apportionment for the keeping, preservation and exhibition of the collections placed or contained in buildings or institutions now situated or hereafter erected in the parks, squares or public places under the jurisdiction of such commissioner. The power of such commissioners to purchase supplies under this section shall continue until the establishment of a department of purchase pursuant to the provisions of chapter twenty-seven of this act.

§625. The commissioner for the borough of The Bronx is hereby authorized and directed to carry out the existing contract made by and between the department of parks of the corporation heretofore known as the mayor, aldermen, and commonalty of the city of New York and the board of managers of the corporation known as The New York Botanical Garden pursuant to the provisions of chapter two hundred and eighty-five of the laws of eighteen hundred and ninety-one, entitled "An act to provide for the establishment of a botanic garden and museum and arboretum in Bronx park in the City of New York and to incorporate The New York Botanical Garden for carrying on the same," as amended by chapter one hundred and three of the laws of eighteen hundred and ninety-four, which contract provides for the alloting and setting apart for the uses of said garden of two hundred and fifty acres of land or less in the northern part of Bronx Park as shown upon a certain map thereof numbered five hundred and sixty-eight, and signed by Messrs. Vaux and Parsons, and filed with the former department of public parks of the corporation known as the mayor, aldermen, and commonalty of the City of New York.

CONSTITUTION AND BY–LAWS OF THE NEW YORK BOTANICAL GARDEN

(As adopted by the Corporation, January 8, 1934)

Article I. Meetings

Section 1. Meetings of the Corporation

The annual meeting of the Corporation for the election of managers and of additional members of the Corporation shall be held in the City of New York on the second Monday in January. A notice of such meeting shall be mailed by the Secretary to each member of the Corporation at least ten days in advance. The number of elective managers may be increased or decreased and vacancies in unexpired terms may be filled, by vote of the Corporation at any annual meeting, and also at any special meeting called upon like notice, and with notice of the proposed action. Vacancies in the Board of Managers may be filled also by the Board. The hour and place of meetings shall be fixed by the President. If a quorum is lacking at any meeting, those present may adjourn the meeting and fix the time and place of the adjourned meeting.

Special meetings of the Corporation shall be called by the Secretary, upon request of the President, or of any three members of the Board.

At any special meeting of the Corporation, additional members may be elected.

Section 2. Nominations

Nominations of managers and of additional members of the Corporation shall be made by the Executive Committee but this provision shall not be held to exclude the nomination of other candidates.

Section 3. Meetings of the Board of Managers

The annual meeting of the Board of Managers for the election of officers and for the appointment of committees shall be held on the second Monday in January or on such other day in January as the President shall select. Other regular meetings of the Managers shall be held on the third Fridays of May, September, and November. Special meetings may be held by direction of the President.

Section 4. Chairman of Meetings

At all meetings of the Corporation and of the Board of Managers, the President shall preside; or, in his absence, one of the Vice-presidents in the order of their seniority of office.

Section 5. Quorums

Nine members of the Corporation shall constitute a quorum at any meeting of the Corporation. One third of the Managers shall constitute a quorum at any meeting of the Board of Managers.

Article II. Officers

Section 1. Election of Officers

At the annual meeting of the Board, the Board shall proceed to organize by electing the following officers to serve for one year or until their successors shall have been elected: a president, one or more vice-presidents, a treasurer, a secretary, a director, a business manager, an assistant treasurer, and an assistant secretary. The president, vice-presidents, and treasurer shall be chosen from among the members of the Board. When considered expedient by the Board, two or more offices may be held by one person.

Section 2. Nominations

Nominations shall be made by the Executive Committee but this provision shall not be held to exclude the nomination of candidates by other members of the Board.

Section 3. Special Elections

In the event of a failure for any reason so to select any or all of such officers at any annual meeting of the Board, or in case any vacancy occurs in any such office from any cause, then an election may be held at any regular or special meeting, notice of such election having been given in the notice of the call for the meeting.

Section 4. Duties of President

The President shall be the chief officer of the Corporation. He shall discharge all duties which ordinarily pertain to the office of President. He shall be a member *ex officio* of all committees. Subject to action by the Board of Managers, he shall have charge of all of the activities of the corporation, with discretionary power and authority in all matters not otherwise provided for.

Section 5. Duties of Vice-presidents

In the absence or disability of the President, the senior Vice-president, if available, shall perform all the duties of the President; and if not available, then such duties shall devolve on the Vice-president next in order of seniority in office.

Section 6. Duties of Treasurer

The Treasurer shall be the custodian of the funds and securities belonging to the institution and shall keep said funds and securities in such banks, depositories, and safety deposit vaults as may be designated by the Board, subject to such regulations as may from time to time be determined by the Board. He shall disburse the current funds of the Corporation as directed by the Board. He shall invest and reinvest all permanent funds as advised by the Finance Committee. He shall report to the Board at all stated meetings. He shall be a member of the Executive Committee.

Section 7. Duties of Assistant Treasurer

The Assistant Treasurer shall perform all the duties of the Treasurer during the latter's absence or disability, except he shall not act as a member of the Executive Committee.

Section 8. Duties of Secretary

The Secretary, unless relieved by the Board of Managers or the Executive Committee, or in the case of any standing committee by the committee, shall attend all meetings of the Corporation, the Board of Managers, and of the standing committees. He shall give notice of all such meetings and shall take and preserve the minutes thereof. He shall be custodian of all documents, and of the corporate seal, and shall with it attest all documents requiring a seal. He shall perform such other duties as may be directed by the Board of Managers or the Executive Committee.

Section 9. Duties of Assistant Secretary

The Assistant Secretary shall perform all the duties of the Secretary during the latter's absence or disability.

Section 10. Duties of Director

The Director shall promptly and efficiently carry out all the directions of the Board and any and all directions of the President. He shall be responsible for the general management and control of all departments and for the proper maintenance and good order of the buildings and grounds, collections, and plants.

He shall from time to time make recommendations for the development and management of the Garden in all its departments, including the laying out of the grounds, the construction of buildings and the conduct of the museums and greenhouses, the herbarium or any of the departments of the Garden, accompanying the same by his estimate of the probable cost therefor.

He may recommend the employment of such persons as shall be needed for the various departments of the Garden.

He shall have power to suspend all salaried employees and, on approval of the Board, or of the Executive Committee, to discharge any employee other than officers elected by the Board of Managers.

He shall use diligent efforts to build up the Garden Herbarium, the Library, and the Museums, and the collections of living plants and trees, by correspondence, by exchanges of duplicates not needed, and by purchase, so far as means therefor are placed at his disposal.

He shall report to the Board of Managers, or Committees of the Board, in such manner and at such times as they may direct.

He shall devote his whole time and energies to the promotion of the Garden interests, and shall not engage in any outside work except with the approval of the Board or the Executive Committee.

Section 11. Duties of Business Manager

The Business Manager, under and subject to the Director, shall be the chief business officer of the Board of Managers. He shall see that the rules and regulations prescribed by the Board for the government of the business affairs of the institution are faithfully observed. He shall be responsible for the economical purchase of all supplies and materials and shall see that all contracts made by the Board are faithfully executed. He shall sign all requisitions for expenditures, such requisitions having been approved by the Director. Further duties may be assigned to him from time to time by the President.

Article III. Committees of the Board

Section 1. Standing and Special Committees

There shall be four standing committees of the Board of Managers, namely:

(a) Executive Committee.
(b) Finance Committee.
(c) Scientific Committee.
(d) Horticultural Committee.

Section 2. Appointment of Committees

The standing committees and the chairmen thereof shall be appointed by the Board at the annual meeting, or as soon thereafter as convenient, to serve until their successors are appointed. The Executive Committee shall make recommendations for such appointments, but such recommendations shall not be binding on the Board.

Special committees may be appointed at any meeting, and may be composed of managers, of members of the Corporation, or of others.

Section 3. Minutes of Committees

Record of the actions of each committee shall be kept by the Secretary and shall be reported to the Board at its next meeting.

Section 4. Executive Committee

The Executive Committee shall consist of seven (7) members, including the President and the Treasurer. It shall fix its own rules of procedure, shall meet where and as provided by such rules and shall keep regular minutes of the business transacted at its meetings.

The presence of at least three members of the Committee shall be necessary and sufficient to constitute a quorum, and the action of a majority of the members of the Committee at any meeting at which a quorum is present shall be the action of the Committee.

Unless otherwise provided by the Board of Managers, the President shall be the chairman of the Committee, and shall preside at all of its meetings.

During the intervals between the meetings of the Board of Managers, the Executive Committee shall possess and may exercise all the powers of the Board of Managers in the management and control of the affairs of the Corporation, except as from time to time shall be

otherwise provided by resolution of the Board of Managers.

The Committee shall annually nominate managers, officers, and additional members of the Corporation and members and chairmen of the standing committees.

Section 5. Finance Committee

The Finance Committee shall direct the Treasurer concerning investments, sales, and reinvestments of funds. It shall consist of three members and the President and the Treasurer as *ex officio* members. Three members of the Committee shall constitute a quorum.

Section 6. Scientific Committee

The Scientific Committee, subject to the instructions of the Board, shall have charge of the scientific and educational work of the institution. It shall be the duty of this Committee to supervise all matters pertaining to the scientific or educational problems of the institution.

The Committee shall consist of such number of members as may be determined from time to time. It shall fix its own rules of procedure, shall meet where and as provided by such rules, and shall keep regular minutes of the business transacted at its meetings. The presence of at least two members of the Committee shall be necessary and sufficient to constitute a quorum. It shall appoint senior members of the scientific staff to meet with it and to make recommendations to it concerning the scientific work, including expenditures and staff necessary to make it effective.

Section 7. Horticultural Committee

The Horticultural Committee, subject to the instructions of the Board, shall have charge of the horticultural work of the institution. It shall be the duty of this Committee to supervise all matters pertaining to the horticultural problems of the institution.

The Committee shall consist of such number of members as may be determined from time to time. It shall fix its own rules of procedure, shall meet where and as provided by such rules, and shall keep regular minutes of the business transacted at its meetings. The presence of at least two members of the Committee shall be necessary and sufficient to constitute a quorum.

The Horticultural Committee shall designate staff members to meet with it and to make recommendations

to it concerning the horticultural work, including expenditure and staff necessary to make it effective.

Article IV. Memberships

Section 1. Memberships

Benefactors, Patrons, Fellows-for-Life, Fellowship Members, Sustaining Members, Life Members, Affiliated Garden Club Members, Annual Members, and Associate Members may be created by the Board of Managers and admitted upon the payment of such sums as shall be approved and established by the Board.

Article V. Advisory Council

Section 1. Advisory Council

The Advisory Council shall be composed of women. It shall consist of at least twelve members to be elected by the Board to serve at the pleasure of the Board. Additional members, upon nomination of the Council, may be elected by the Board at any regular or special meeting, or by the Executive Committee.

The Council may make proposals to the Board of Managers in regard to the improvement and development of the Garden and may act in other matters, including the arrangement of social functions, that may be referred to it by the Board.

Article VI. Miscellaneous

Section 1. City Bills

The President or any Vice-president or the Treasurer or the Assistant Treasurer is authorized to approve bills of the Garden against City maintenance appropriations.

Section 2. Loans

No loan shall be made to any manager, officer, or employee of the institution.

Article VII. Amendments

Section 1. Amendments

Amendments to the Constitution and By-Laws may be made at any meeting of the Board of Managers by a vote of a majority of the entire Board or by the unanimous vote of a quorum, provided notice of such proposed changes shall have been sent to the members of the Board with notice of the meeting.

Article VIII. Former By-Laws

Section 1. Former By-Laws

The former Constitution and all former By-Laws as well as former rules and regulations governing the offices of Treasurer, Director, and Business Manager are hereby repealed.

MYCOLOGIA ENDOWMENT FUND

On May 11, 1933, the Managing Editor of *Mycologia* received a check for one thousand dollars ($1,000.00) from one who wishes to be referred to merely as "a friend of *Mycologia*." At the suggestion of the Managing Editor this was accepted by the Board of Managers of The New York Botanical Garden and set apart as the nucleus of an endowment fund, with the following resolution:

"*Resolved*, That the gift of $1,000 from an anonymous donor be accepted, subject to the provisions of confidential letter on file with the Secretary, and the Director is hereby instructed to express the very sincere thanks of the Executive Committee to the very generous contributor.

"*Resolved, further*, That the gift of $1,000, referred to in the above minute, be added to the restricted endowment funds, the income only to be used for the support of *Mycologia*."

It is expected that this fund will be added to from time to time, either by private donation or funds from the sale of back sets published previously to 1933.

Fred J. Seaver.

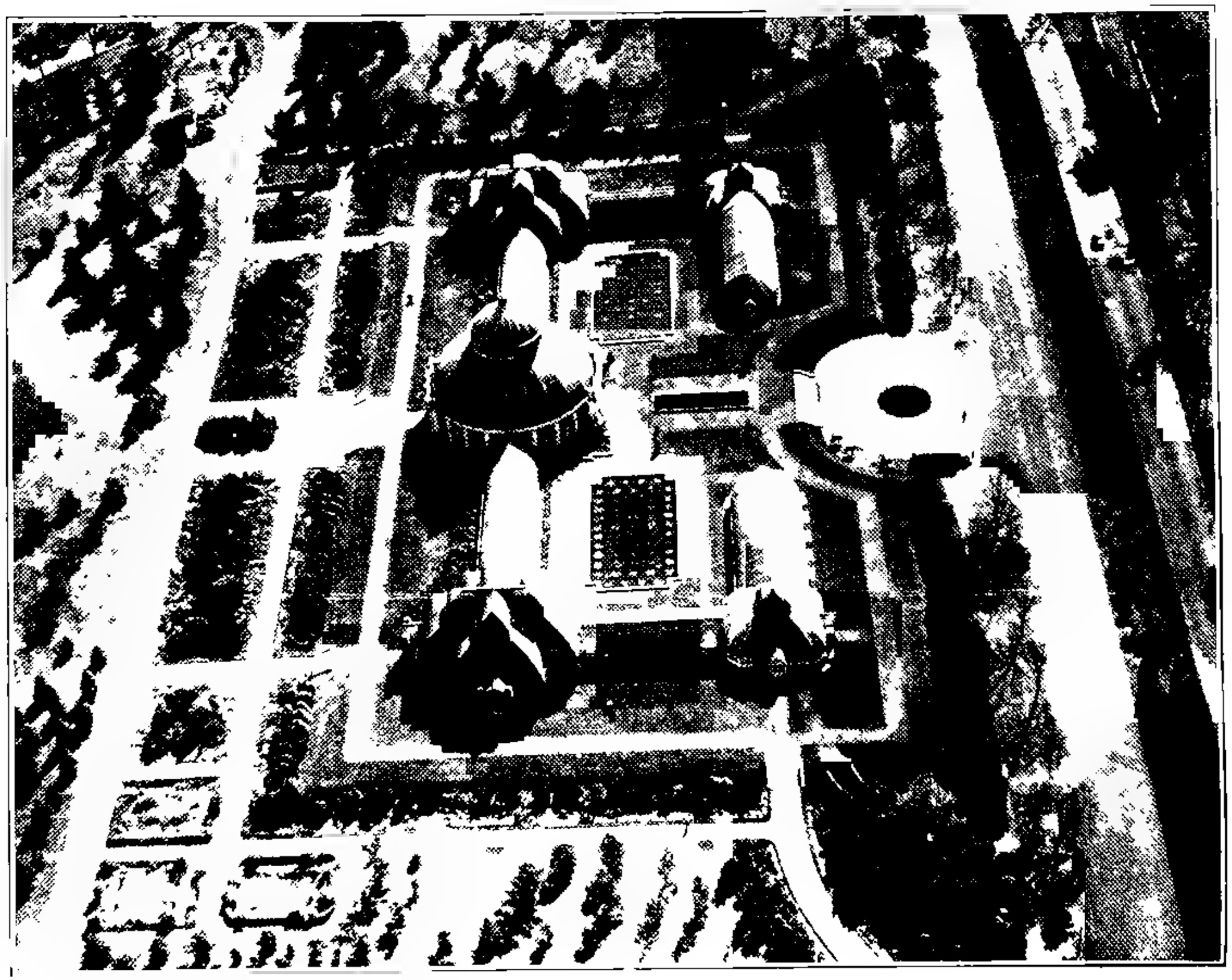

FIGURE 1.
Conservatory Range No. 1 of The New York Botanical Garden in Bronx Park, as seen from the air.

(Photograph by courtesy of The New York Daily News.)

PUBLICATIONS OF

THE NEW YORK BOTANICAL GARDEN

Journal of The New York Botanical Garden, monthly, containing notes, news, and non-technical articles. Free to members of the Garden. To others, 10 cents a copy; $1.00 a year. Now in its thirty-fifth volume.

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Bulletin of The New York Botanical Garden, containing reports of the Director-in-Chief and other official documents, and technical articles embodying results of investigations. Free to all members of the Garden; to others, $3.00 per volume. Now in its fourteenth volume.

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THE NEW YORK BOTANICAL GARDEN
Bronx Park, New York, N. Y.

GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a beautiful rose garden, a rock garden of rock-loving plants, and fern and herbaceous gardens.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of narcissi, daffodils, tulips, lilacs, irises, peonies, roses, lilies, water-lilies, gladioli, dahlias, and chrysanthemums; in the winter displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 43,400 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be sent to

THE NEW YORK BOTANICAL GARDEN
BRONX PARK, NEW YORK, N. Y.

VOL. XXXV MARCH, 1934 No. 411

JOURNAL
OF
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WITCHES' BROOMS ON SOUTHERN WHITE CEDARS
B. O. DODGE

HOTBEDS AND COLDFRAMES
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HOUSE-PLANT CULTURE MADE EASY
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WITMER STONE

A GLANCE AT CURRENT LITERATURE
CAROL H. WOODWARD

LECTURES SCHEDULED FOR MARCH, APRIL, AND MAY

NOTES, NEWS, AND COMMENT

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JOURNAL
OF
The New York Botanical Garden

VOL. XXXV MARCH, 1934 NO. 411

WITCHES' BROOMS ON SOUTHERN WHITE CEDARS[1]

The common red cedar, *Juniperus virginiana,* is subject to attack by the rust parasite *Gymnosporangium Nidus-avis,* which may bring about the premature death of the tree as noted in previous numbers of this JOURNAL.[2] In its effuse form the fungus spreads up and down the large limbs and into the trunk, where it destroys long strips of living bark. When the growing tip of the branch is invaded, a bird's nest or witches' broom type of abnormal growth usually follows. If the fungus does not spread very far down into the branch, little damage beyond the death of the end of the branch for five or six inches results, but when the parasite runs down into the limb, large stag-horn brooms develop. A tree with a number of such infected branches is greatly handicapped because such limbs usually die off early.

The southern white cedar, *Chamaecyparis thyoides,* is also susceptible to infection by several species of the rust genus *Gymnosporangium.* One species in particular is especially destructive in some cases. This species, *Gymnosporangium myricatum,* is very common wherever the southern white cedar grows in the vicinity of the bayberry, *Myrica,* which is the alternate host for the fungus.

The spores develop on beautiful orange-colored spots on bayberry leaves in the summer, and are carried by wind and insects to the young leaves of the cedar. Infection incurs either on the leaf blade itself, or in the axil of the leaf, and rust pustules burst out at these points the following spring. From here the fungus grows down through the leaf base into the cortex of the branch, where it becomes firmly established. The peculiar stimulation exerted by the parasite on the host tissues leads to the development

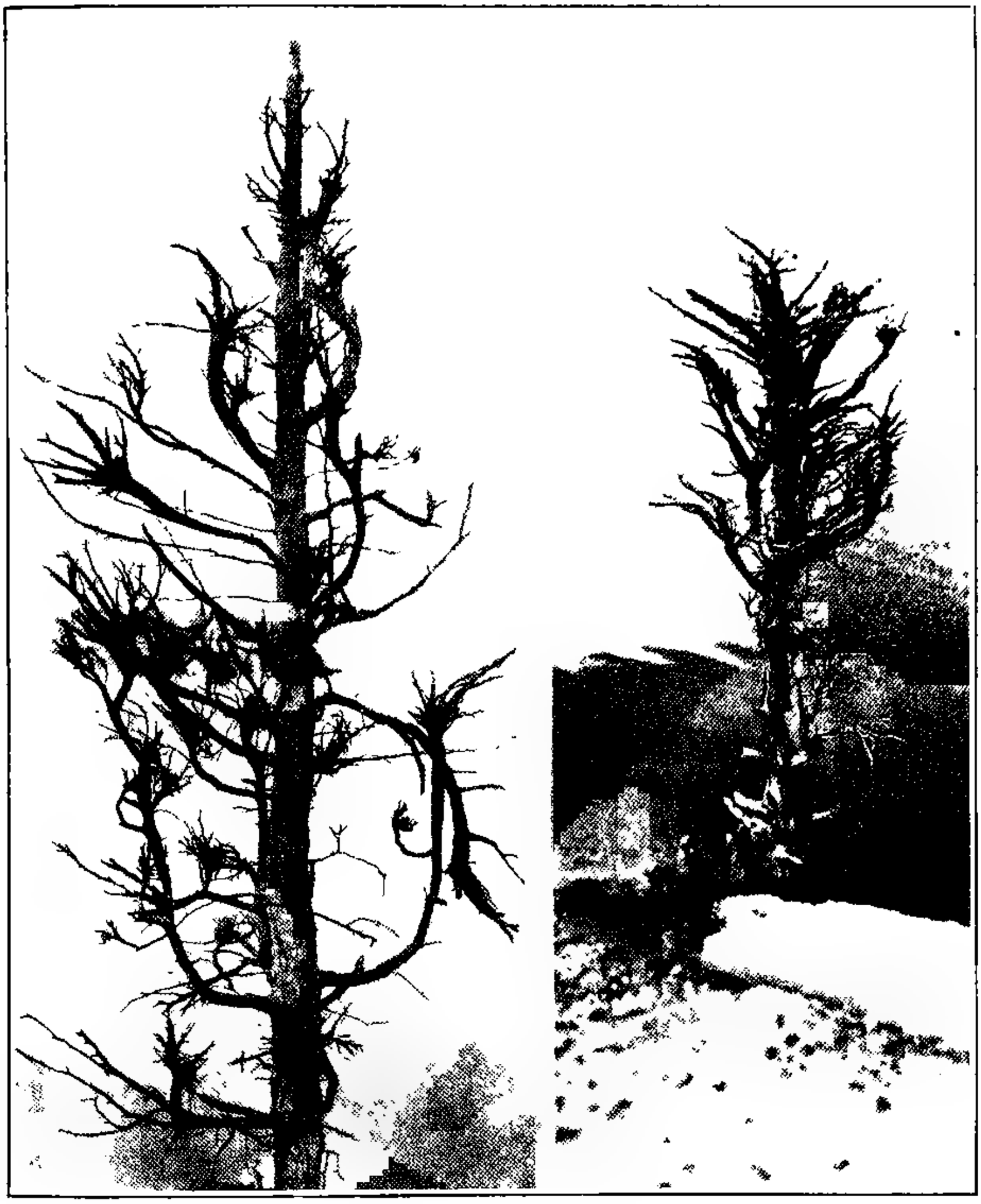
[1] Studies in the genus *Gymnosporangium*—VIII.

[2] Jour. N. Y. Bot. Gard. 32: 101–108. 1931; 34: 233–237. 1933.

of numbers of accessory buds, so that eventually a witches' broom type of growth is formed. The infecting threads of the fungus travel along between the cells of the living host tissue in groups or in fascicles, sending out feeding organs, haustoria, into adjacent host cells, which are stimulated to divide and increase in size. Sections of infected branches or trunks show pockets and strands of abnormal parenchyma cells associated with the fungus hyphal threads at various points in the wood and living bark. One is reminded of the abnormal tissues he finds in crown galls of plants and in malignant tumors or cancers of animals.

Young seedlings of the southern white cedar two or three inches high may become badly infected so that their growth is very much retarded. An infected plant ten or fifteen years old may be no more than a foot or two high. It presents the appearance of a plant artificially dwarfed or stunted when terminated by a finely branched witches' broom. Such plants eventually die. This is no serious matter, since great numbers of seedlings always develop in any cedar grove. Most of them must eventually die off from natural shading. On the other hand, when trees reach some size and many branches become infected, the loss would be considerable if the trees were of great economic importance. FIGURE 1 shows two trees about six or eight inches in diameter at the base that had been killed as the result of numerous infections. They were cut down and brought to the lake shore, where they were stood up for photographing. The terminus of the tree shown at A was never infected. Yet so many of its branches were killed from deep-seated infections that the whole tree died. The tree shown at B was originally infected in its terminal shoot when it was young and about five or six feet high.

The southern white cedar is found most abundantly along the Atlantic Coast from Cape Cod to South Carolina. A number of groves have been reported in New York and New Jersey rather far north for this species. These isolated stands are being cut out because of the value of the trunks for poles. It is probably one of the species of trees of eastern United States that is bound to disappear eventually. If it were of sufficient importance economically, it could be kept free of the rust by cutting out the bayberries. On the other hand, there might be a sale for just such bizarre forms,



A B

FIGURE 1. *Chamaecyparis thyoides.* A. A tree about fifteen feet high and six or eight inches in diameter at the base. The numerous witches' brooms were developed on the branches as the result of separate infections by the rust parasite *Gymnosporangium myricatum.* The terminal portion of the tree was never infected. B. A tree originally infected at the growing tip of the main axis. Subsequent infections show on branches lower down. These specimens were carried to the lake shore for photographing.

dwarfed and stunted by the parasite. In such case one could readily infect the seedlings by sowing spores from the bayberry.

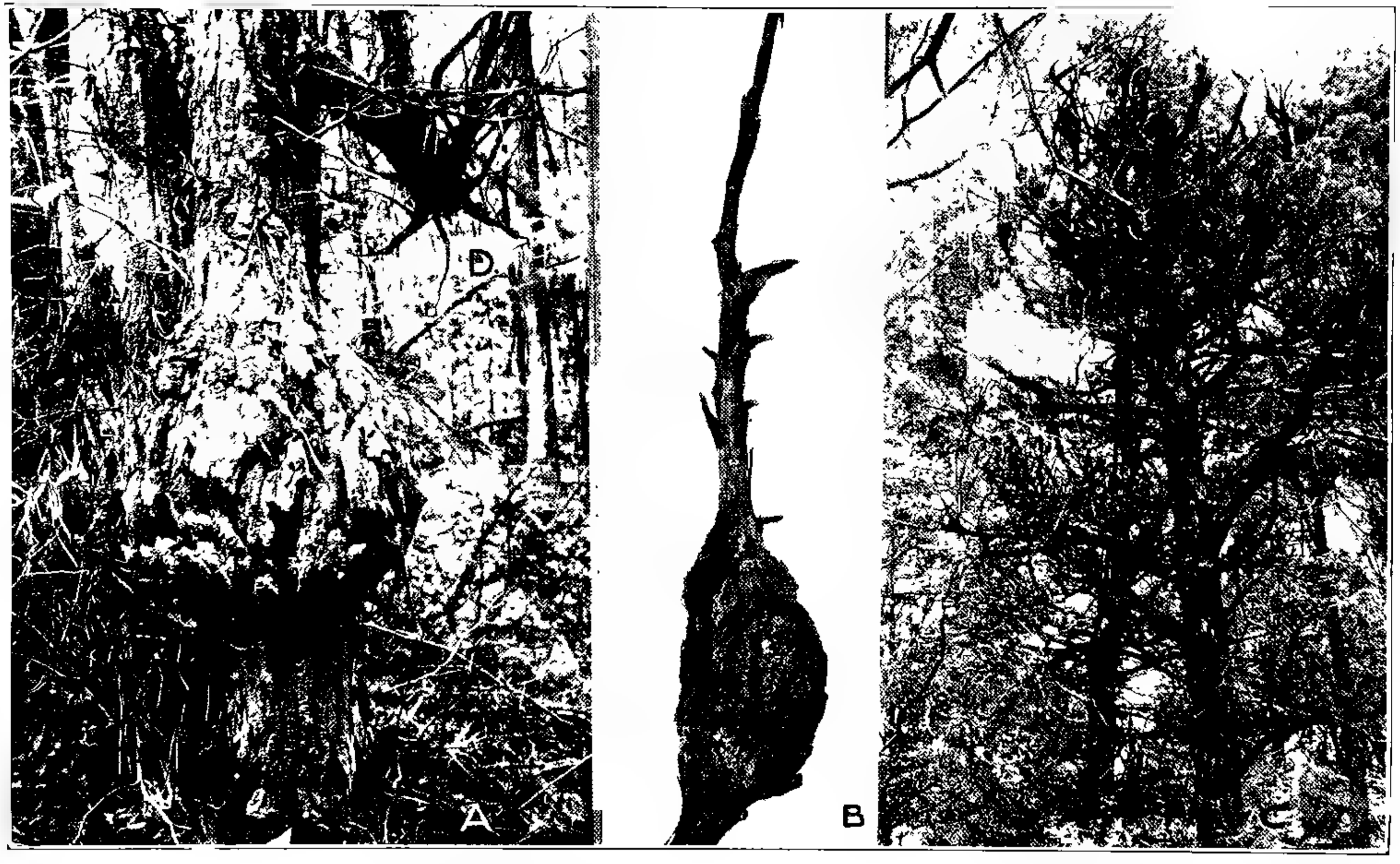


FIGURE 2, A, B, C. Burls on the trunk and branches of *Chamaecyparis thyoides*, the southern white cedar, caused by the rust parasite *Gymnosporangium botryapites*. The stag-horn abnormality shown at D, left above, was caused by *G. myricatum*

There is a second species of rust, *Gymnosporangium botryapites,* which invades the limbs and main trunk of the southern white cedar. Its alternate host is the common shad-bush, *Amelanchier,* which is usually found along with the bayberry in regions suitable for the cedar. The two rusts are, therefore, often found side by side on the same tree or on the same branch. Of the two, *G. botryapites* is the less destructive, one reason being that, although its vegetative or feeding mycelium thoroughly invades the cortex or living bark, it does not penetrate the cambium ring. It stimulates the formation of an excess of wood, so that a spindle-shaped burl develops at the point of infection (FIGURE 2, B). This growth occurs at the expense of that part of the branch above, so that the top end eventually dies. A tree may bear a great many such burls. FIGURE 2, *C,* shows such a tree that had died from the effects of many separate infections. There were a number of such trees in a cedar grove near Woods Hole, Mass.

FIGURE 2, *A,* shows a burl at the base of a living tree. Such swellings are sometimes as much as two feet in diameter. This particular tree must have been originally infected on one side when it was very young. Since the swelling extends only half way around the trunk, the tree has been able to grow on for many years. Whether a branch or trunk bearing a burl dies or not depends upon how completely the parasite encircles it. If the spindle is one-sided, this means that the fungus has not invaded the flat side as yet. Completely circled, however, the branch will die early. The stag-horn witches' broom shown at D in FIGURE 2, was caused by *G. myricatum.*

More complete accounts of the parasitism of species of cedar rusts are being published in *Proceedings of the National Shade Tree Conference* and in *Mycologia.*

B. O. DODGE.

46

HOTBEDS AND COLDFRAMES[1]

The number of plants one can start successfully in a hotbed or coldframe is surprising to the gardener of small experience, who thinks of these structures merely as early protection for certain types of young plants.

In a hotbed, for instance, besides raising seedlings, cuttings of such plants as ageratum, heliotrope, geraniums, and petunias can be rooted, as well as dahlias which are started early. Cannas, the tubers of which have been divided, will produce good-sized plants from the hotbed before the time comes to set them outdoors.

For those who have the accommodations, there are numerous vegetables that can be produced early, such as asparagus, lettuce, radishes, scallions, and rhubarb.

In this vicinity a hotbed is best started about March 10. Choosing a proper site for it must be the first consideration, for the tender young seedlings will want all the sun they can get and will suffer severely if exposed to the bitter winds of early spring. A sudden chill, either by day when the sash is opened for ventilation, or by night when the temperature drops unexpectedly low, is sure to damage them. Yet they require ventilation daily –unless the weather is distinctly unfavorable—and at the same time a moderate range of temperature must be maintained both night and day. A southern exposure with protection, such as a building, a wall, or a hedge at the north, is therefore most desirable.

The first step in the preparation of a hotbed is to procure the fermenting material. I prefer a combination of manure and dry leaves, for unless stable manure is properly prepared, it has a tendency to fire—that is, to get extremely hot for a few days, then suddenly cool down, in most cases never to heat again. Leaves alone do not give sufficient heat unless in a very large mass, but by mixing them with manure, a reasonably uniform and lasting heat will result.

These materials should be procured about ten days before they are needed for use. The leaves should be allowed to settle, then thoroughly mixed with the manure. Then, as well as later, if any

[1] Abstract of a lecture given at The New York Botanical Garden on Saturday afternoon, December 16, 1933.

of the manure is found dry, it should be sprinkled. The mixture should be stacked high, preferably under cover from rain, though it is important that the cover should not rest directly on the pile, as this would cause the mass to heat too quickly.

If evidence of fermentation is not apparent within a few days, it may be that either too much straw has been included or that the mixture is too dry. In the first case, shake out some of the straw and add more stable refuse; in the second, add a moderate amount of water. Do not be discouraged, for even the skilled gardener sometimes experiences failures with hotbeds.

About the fourth day after fermentation begins, it will be time to turn the pile over to cool it down a bit, repeating the procedure three days later, and wetting any dry spots that are found.

The Frame and Soil

A deep concrete or hollow-tile frame which can be filled with the fermented material generally makes the most efficient hotbed, but where such construction is not available, good results may be obtained from a simple but sturdy wooden frame, which can be easily made to fit standard-size six by three sash. In this case, the hotbed is built on top of the ground, and the frame is set upon it. The fermenting manure and leaves should extend well outside the area of either type of bed.

If a wooden frame is being used, it is a good idea to measure off the size planned for the hotbed and add from one to two feet on every side. Drive a stake into each corner as a guide, and fill this entire area with the material prepared. Spread it evenly, wetting down any part that seems dry, and trample it firmly, leveling it across the top. The finished pile should be at least two feet high when the frame is set in place.

Plunge a thermometer into the bed, and then place the sash on top.

For a few days the temperature will hover around 95 degrees. When it remains steady for a couple of days, the bed is ready to receive a covering of soil. If, however, the temperature rises much higher, then suddenly drops, the only thing to do is to start again, incorporating fresh material and, if needed, a little more water, into the mass.

The soil to be used in the hotbed should be a compost of good fibrous loam, broken up finely. To every wheelbarrow full, add an equal quantity of fine leaf-soil or humus and a couple of shovels of coarse sand, mixing it all thoroughly.

Place this compost in the frame to a depth of six inches, firming it moderately. The last half inch should be passed through a quarter-inch screen. The bed then should be left for two days to warm through before receiving the seed, which can be sown in drills or scattered broadcast with a handful of fine soil. Press the seed down gently into the soil with a flat board, and water with a fine rose sprinkler.

If the hotbed is being used to germinate seed in boxes or small pots, about three inches of ordinary garden soil will be sufficient. This also should be fairly well firmed and leveled, so that the boxes and pots will stand evenly. If all small pots are being used, they may, however, be plunged into a greater depth of soil, and thus will require less watering.

Temperature and Ventilation

As soon as the bed is made, it should be covered at night with a mat, for although it may not freeze, it should be kept at as even a temperature, day and night, as possible. Upon germination, the seed will require constant attention, to see that it gets neither too wet nor too dry, too little or too much ventilation. Without this care, one is apt to find that all the young plants are lying down dead.

In handling the ventilation, one should always open the side of the sash which is away from the wind. Some days merely a small stick placed under the sash will suffice to give the young plants the fresh air they need. If the moisture which has condensed on the glass and sometimes on the leaves is allowed to remain too long, because of lack of air, the plants will get soft and weak, then when the sun strikes them they will burn.

I am interested in the development of electricity for the heating of hotbeds, and hope that it will be so perfected in a short time that we will be able to do away with the bother of mixing leaves and stable refuse and rely entirely upon electricity for heat. Perhaps amateur gardeners will then be tempted to raise the choicer flowers for their summer gardens.

Uses for a Coldframe

If one has any kind of a hotbed in use, a coldframe is also necessary for the hardening of plants taken from the former. One can also sow seed in a coldframe much earlier than outdoors. In fact, I have sometimes seen better seedlings raised in a coldframe that had been well protected in bad weather than in a hotbed that had been planted at the same time. The plants blossomed later, but were more stocky and often produced better flowers.

Except for summer use, when protection from sun is desired, a coldframe should have the same southern exposure recommended for hotbeds. It can be made of wood, concrete, brick, stone, or hollow tile, while the sash, or covering, may be of glass or of a glass substitute, such as celo-glass, or, for summer and early fall use, lath slats.

In springtime, while we still expect some frost, the glass or glass substitute should be used, with a cover for night-time when cold weather threatens.

After the frame has been placed in a well-drained situation, the area inside it should be excavated to a depth of at least six inches and a wire screen with a small mesh placed around the wall, for protection against ground moles and field mice. Then fill in the excavation with a good compost consisting of topsoil, a little sand, and leaf soil or humus or granulated peat. Rake it level, eliminating all lumps, and, if it seems dry, water it thoroughly and let it drain for a day before sowing seeds or setting out plants.

Seeds sown in a coldframe in spring are best dropped into drills, pressed down with a board, watered with a fine spray and kept covered with both the sash and a mat until germination starts. On all favorable days, give them ventilation, and water them when necessary.

The need for water can be determined by squeezing a little soil between the fingers. If it does not pack down, it is too dry. It is well to do the watering early enough in the day so that the foliage will be dry before the frames are closed up for the night. Otherwise the plants are likely to die from damping off.

In using a coldframe for sowing seed in summer, laths are needed either on top of the sash or directly across the frame, to

keep seed from drying out too quickly in the sun, and also to protect them from sudden showers. When several varieties of seed are being sown at once, it is wise to place those that germinate quickly apart from those that are slow, in order that each may be given the care required for its particular stage of development without disturbing the others.

A coldframe need never be idle, for when it is emptied of the early annuals, seed for perennials can be sown and the seedlings kept there until fall, when they may be planted in the garden.

Then the frame may be used for the winter storing of such plants as chrysanthemums, which, though they are hardy, will winter better if kept fairly dry. Cover them with a few leaves, and prop up the sash a couple of inches, then forget about them until spring.

If one can conveniently place a small frame in a somewhat sheltered northern position, it will be handy for rooting a good batch of cuttings early in the summer, such as petunias, verbenas, and other quick-growing annuals. For fall use, ivy can be propagated in this manner. Cuttings put in the frame early in August and covered at the approach of cold weather will be ready for planting out the following spring.

With a little experience, one can produce a great variety of subjects for the garden in either a coldframe or a hotbed.

JOHN H. WATTS.

HOUSE-PLANT CULTURE MADE EASY

The difficult problems in house-plant culture are usually three: dry air, improper temperatures, and insufficient light. The first can be entirely overcome and the second greatly alleviated by growing the plants in glass cases—the Wardian cases and ferneries of the past generation, now renamed "terraria" to make them sound scientific for school study.

To give plants the benefits of moist air and protection from drafts, and to remove some of the objections to the cumbersome glass box usually employed, the design here illustrated was developed at The New York Botanical Garden. It has the advantages

FIGURE 1. A simple and inexpensive terrarium which can be built at home for the growing of tender house-plants for decoration.

of lightness, simplicity of construction, and easy portability of the glass portion, so that it may be entirely removed on occasion.

The case is made of ordinary window glass of any convenient size, so that shape and proportions may conform to individual taste. Double-thick glass or plate glass adds to the durability, but also to the weight and to the cost of a case. The glass is clamped together with metal box-corners, using two corners of different sizes for inside and outside, joined together by a bolt passed through holes drilled through the tip of each box-corner. These holes have to be drilled specially, as this is not a normal method of fastening. The inner, smaller corner is lined on the outside with thin cork sheeting, to protect the glass when the clamp is tightened. Apparently this very simple type of clamp has not been previously used in this way. To join the glass closely it is only necessary to cut off about one quarter of an inch from the corner of each pane. Eight such clamps will fit together a glass top like the illustration, and may be tightened firmly enough to make it entirely safe to lift around bodily, without danger of breaking.

This top may be fitted on any kind of a rectangular base or even placed over flower pots or jardinières if desired. The illustration shows it on a fiber board (Masonite) base, which encloses an ordinary seed flat, resting in a copper tray to catch the drainage water.

The plants used in this particular case are warm tropical shade-plants, thriving at temperatures of 65 to 75 degrees in the day and 60 degrees at night. Most of the begonias, tropical ferns (*Pteris, Nephrolepis*, etc.), fittonias, selaginellas, peperomias, cyatheas, and many other plants that we usually associate with greenhouses and conservatories succeed very well in an ordinary living-room, with moderate weekly watering, when protected by this glass cover.

The more easily grown house plants—flowering begonias, tradescantias, Boston ferns, Chinese evergreen (*Aglaonema*), bracket plant (*Chlorophytum*), etc., will also do well in a Wardian case, but usually do not require its protection. Maidenhair ferns can also be kept here, and if grown in pots can be taken out for a few hours occasionally for table decoration, without endangering their continued health. In fact, a very good plan is to grow flowering and foliage plants in pots plunged in sphagnum or peat moss to keep them moist, and protected by a glass covering. Then they

can be kept in good growing condition with little attention, and can be taken out for table decoration whenever wanted.

Often the best window in the house in which to grow plants may be in the cellar, in a spare room or a cool sun-porch, instead of the living-room and dining-room, where we really want a cheerful show of flowers. By growing the plants under glass covers in the most favorable location, and taking them out only temporarily for show, we can always keep a good stock of healthy house plants and considerably prolong the usefulness of even the more difficult greenhouse-flowering plants, such as the cyclamen.

FORMAN T. MCLEAN.

SMALL'S "MANUAL OF THE SOUTHEASTERN FLORA"*

While our first association with Dr. Small is with the flora of his home district, Lancaster and Dauphin Counties, Pennsylvania, his name, since his coming to Columbia University in 1892 and then The New York Botanical Garden in 1898, has been inseparably connected with the plant life of our southern states. To those who had to rely upon Chapman's "Flora" and scattered periodical literature in their botanical researches south of Virginia, the appearance, in 1903, of Dr. Small's "Flora of the Southeastern United States" was a veritable god-send and it is difficult to realize how we managed to accomplish anything in this field without it.

A second edition, published in 1913, brought this bulky volume thoroughly up to date and now, after a lapse of twenty years, we have what is essentially a new work by the same indefatigable author: "Manual of the Southeastern Flora."

The earlier "Flora" included in its range much of the southern-central states west of the Mississippi River, involving many components of a flora differing not a little from that of the south Atlantic states. This tended to complicate the treatment and resulted

* Manual | of the | Southeastern | Flora | Being Descriptions of the Seed Plants growing naturally | in Florida, Alabama, Mississippi, eastern Louisiana, | Tennessee, North Carolina, South Carolina | and Georgia.| Illustrated | By John Kunkel Small | New York | Published by the Author. 1933. Pp. i–xxii + 1–1554. Issued by the Science Press Printing Co., Lancaster, Pa. Price, $10.50.

in a volume too large for easy handling. The present work is wisely restricted to the region east of the Mississippi and south of the northern boundaries of North Carolina and Tennessee, leaving the western half of the original area for a proposed companion volume to be published later. Even with this limitation, there are included many plants of quite distinct floras from that to which the work more properly refers, as for example the northern intrusions along the higher mountains and the tropical element in southern Florida. These are, however, rightly included, as it is far better for a "manual" to have definite political boundaries than to attempt to exclude species belonging more or less to other floral regions, the boundaries of which are not susceptible to definite delimitation.

In his introduction, Dr. Small explains the "plant provinces" of the area he covers and plots them on a map. First of all, and greatest in extent, is the "Coastal Plain," reaching from southern New Jersey to Florida and Texas and extending up the Mississippi to the mouth of the Ohio, closely comparable to the "Austro-riparian zone" of the zoölogists. Middle Kentucky and Tennessee form the "Interior Low Plateau," which skirts the mountains on the west, while east of the highlands, lying between them and the Coastal Plain, is the "Piedmont." The mountain provinces, running in narrow belts northeast and southwest, are the "Blue Ridge," "Appalachian Valley," and "Appalachian Plateau." The names of these provinces are frequently and conveniently used in the statements of ranges to indicate the region in which a plant reaches its maximum development.

The ranges are given from the south northward, as seems proper in a "southern" flora, and the author cleverly points out that the last great plant migration on this continent, following the retreat of the ice, was from south to north, so that this method of statement presents a rough picture of the result of the post-glacial retreat. While we highly approve of this method as far as the present-day southern or wide-ranging species are concerned, we wonder if a north to south statement in the case of northern intrusions along the mountains would not have more clearly indicated their geographic relationship. However, it is difficult and perhaps undesirable to use two methods in the same work, and inconsistency always invites criticism!

There are keys to the orders, families, genera, and species, which

seem to be excellently constructed, although practical experience, as in all cases, will be the test of their usefulness. The descriptions have apparently been entirely rewritten and seem more concentrated, with more emphasis on the important characters, but the greatest improvement upon the earlier work is found in the series of excellent text-figures illustrating the structural characters of one species in each genus. These are drawn mainly by Miss Mary E. Eaton, but those illustrating the grasses are by Mrs. Agnes Chase and those for the genus *Carex* by Mr. H. Creutzberg. These figures will, we anticipate, prove of the same invaluable assistance, especially to the amateur, as did the specific figures in Britton & Brown's "Illustrated Flora" and in the same measure aid in the advancement of systematic botany in the area covered by the present manual.

Dr. Small's attitude toward species and genera is stated in the preface as follows: "What has seemed to the author a balanced course has been followed—traditional 'lumping' and modern 'splitting' have not influenced the treatments of the various groups. Complex genera have been divided into more natural groups, both for convenience of study and also in order to make the genera, as far as possible, correspond in rank to the great majority of groups of species now recognized as genera by most present-day botanists.

"Species have been interpreted in the broader sense; minor variations of species, varieties, or subspecies have not been considered to any great extent. 'Subvarieties,' 'forms,' 'subforms' have not been considered at all."

With the latter paragraph we are in hearty accord, since taxonomic subspecies such as are recognized in zoölogy do not seem to exist among plants, while "forms," etc., have no place in a systematic work.

As to genera, there will always be difference of opinion, and while Dr. Small's treatment will doubtless appeal to the great majority of working systematic botanists, the host of amateurs, who furnish not a little of our practical field data, will probably prefer the broader genera of old. The reviewer admits that he is a conservative and would rather see the maples all in the genus *Acer*, with subgeneric headings for the Sugar, Silver, and Red Maples, than be compelled to refer to these three groups as *Saccharodendron*, *Argentacer*, and *Rufacer*. "Convenience" is one of the arguments

for generic splitting, but every time we divide an old genus into several new ones we render many names unrecognizable to all but those who are in close touch with the specialist on the groups in question. And would not the subgeneric divisions answer the purpose of the advanced systematist just as well? Perhaps there is some "convenience" on the other side of the argument too!

As a matter of fact, this whole problem is the result of trying to make a binomial name serve two quite irreconcilable purposes—on the one side as a tag by which we can inform others what we are talking about; on the other as an attempt to indicate the phylogenetic or taxonomic relationship of the species. As we emphasize one purpose we destroy by that amount the utility of the other. Would that some Linnaeus the Second might devise a "systema" that would remedy this nomenclatural crux!

English names are given by Dr. Small for all species which possess them, placed in parentheses at the end of the description, but no attempt has been made to invent them where none is available, which is a sensible practice. Introduced species are treated exactly as endemic forms, with no change in typography, the statement that they are natives of some other country being added at the end of the range.

It is unfortunate that Dr. Small could not have added the ferns to his manual. It is perfectly consistent to exclude them from a work on "flowering plants" but they are so frequently associated with the latter by amateurs and field collectors that their omission will be regretted by many, and it would seem to have been a good business proposition to have included them.

We find in the preface acknowledgments to many botanists who have assisted in the preparation of the work, especially by furnishing the text for some thirty of the genera upon which they are authorities. Acknowledgment is also made to Dr. A. S. Hitchcock, who wrote the entire text for the family Poaceae, to Dr. E. T. Wherry for the text of Polemoniaceae, Dr. F. W. Pennell for the Rhinanthaceae, Dr. J. H. Barnhart for the Pinguiculaceae, Dr. William Trelease for the Loranthaceae, and to Mr. K. K. Mackenzie for *Carex* and *Solidago,* two large genera of the *Cyperaceae* and *Carduaceae,* respectively. Important as these contributions are, however, they form but a small part of the 233 families, 1,518

genera and 5,557 species which are considered in the volume, most of which have been worked out entirely by the author himself.

When we realize the magnitude of the task, we feel that botanists certainly owe Dr. Small a debt of gratitude for the splendid, painstaking work that he has produced—admirably conceived and conscientiously carried out. In our reading of it we find practically nothing to criticize and everything to praise, and we sincerely hope that it may receive the recognition that it so abundantly deserves and that the author may be encouraged to undertake the completion of the similar volume that he has in mind, which will place our knowledge of the trans-Mississippi lowland flora on the same high plane that has been achieved for that of the southeastern states in the volume before us.

WITMER STONE.

A GLANCE AT CURRENT LITERATURE[1]

"The Flowers of Japan and the Art of Floral Arrangement" is among the books recently added to the Garden Library. Written in 1891 by Josiah Conder, who was then Architect to the Imperial Japanese Government, it deals with the history, theory, and practice of floral arrangement, including the etiquette of the art and its relation to certain ceremonies. The volume is illustrated with full-page plates, hand-painted by Japanese artists, and by a number of explanatory sketches and diagrams.

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H. H. Thomas is responsible for two of the library's latest acquisitions—"The Book of Hardy Garden Flowers" and a two-volume work, "Gardening for Amateurs," which he edited.

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Containing chapters from authorities in several languages, the "Manual of Bryology" edited by Frans Verdoorn and published in The Netherlands, is a work of international usefulness.

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The Bartlett Tree Research Laboratories present an invaluable

[1] All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

booklet under the authorship of E. P. Felt, entitled "The Dutch Elm-disease and its Control."

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J. Horace McFarland writes on "The Winter Garden" and "Outdoor Chrysanthemums" in the December issue of his *Breeze Hill News*.

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Winter gardens are also the subject of Dorothy E. Pletcher in *Nature Magazine* for January, where she describes the color effects of broad-leaved and coniferous evergreens and of berried trees and shrubs, dating the use of these subjects back to the time of Sir Francis Bacon, in the sixteenth century.

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Advising a "lynx eye" for the inspection of house plants for signs of disease, Florence Taft Eaton tells how to care for plants indoors in winter-time, in the January *Gardeners' Chronicle of America*. At the first sign of aphis, she recommends immersing the whole plant in cool suds.

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Many interesting notes on desirable plants for gardens, besides a valuable illustrated article on pests of rhododendrons, are contained in the *New Flora and Silva* of last October. This is the fifth anniversary number of the magazine.

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"El Laberinto," a beautiful Spanish garden in neo-classic style, overlooking the Mediterranean near Barcelona, is described by Virginia Prince and Eleanor Roche in the *Landscape Architect* for October.

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Ethylene gas as a stimulant for root development is treated by C. A. Michels in the *Gardeners' Chronicle of America* for January. Other features of outstanding interest to gardeners include articles on fashions in flowers, illustrated with photographs of bouquets, on rock gardens and their plants, construction of a summer-house, shrub roses, and distinctive trees.

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In "Sources of Carbohydrate for Germination and Growth of Orchid Seedlings," in the *Annals of the Missouri Botanical Garden* published in November, F. Lyle Wynd traces the study of the sym-

biotic relationship between endophytic fungus and the roots of orchids, and reviews the latest experiments in this field.

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How the downy mildew of tobacco has been controlled by temperature, in experiments made by the United States Department of Agriculture, is told in the December 29th issue of *Science*.

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"Some Significant Estimates of Losses from Plant Diseases in the United States" is the subject of Neil E. Stevens in *Phytopathology* for December. He takes up figures from the production of wheat, peaches, sweet potatoes, forestry products, and other important crops.

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Bruce Bryan tells a fascinating tale of how the reading of tree-rings back more than a thousand years has made it possible to give exact dates to the Pueblo civilization of southwestern United States, in the January number of *American Forests*. The correlation was not thought of, he says, until Dr. Andrew Ellicott Douglass embarked on his task of studying tree-rings in connection with sun-spots. The Pueblo rings which were read were in timbers used in the construction of the houses.

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Herbert F. Copeland supports the accepted conventions of botanical nomenclature in *Science* for January 5, in opposition to Dr. R. W. Brown, who in a previous issue had offered suggestions for changes in the system.

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Chlorine injury to plants is most likely on sandy soils, it is pointed out in the December *Nursery Disease Notes* published by the New Jersey Agricultural Experiment Station. It is further stated that the chlorine in a water supply is probably not injurious to plants in a greenhouse, but that, on the contrary, it has a definite stimulating effect.

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The Florists' Exchange announces the publication of its 1934 Horticultural Trade Directory, listing 450 horticultural associations in the United States, including florists, nurserymen, and seedsmen, besides general horticultural associations and those formed to develop specified lines of plants.

More than 700 pages are devoted to termites and termite control in a new book by that title just issued by the University of California Press. It appears as an official report of the Termite Investigations Committee, and its 56 chapters, prepared by 34 different authorities on this destructive insect and on related fields of study, seem to cover every conceivable phase of the life history and distribution of the termite, the damage it does, and possible measures for its control. The work of the large committee, with which Dr. E. D. Merrill was associated for two years before coming to The New York Botanical Garden, is outlined in an introduction by A. A. Brown, the chairman. The book has been prepared with Charles A. Kofoid, Professor of Zoölogy at the University of California, as editor-in-chief.

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Current issues of bulletins relating to special groups of flowering plants which have lately been received by The New York Botanical Garden include the *American Peony Society Bulletin, The American Rose Magazine,* and the *Bulletin of the American Iris Society.* The last-named contains excellent illustrations of Iris species.

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"Conservation" is the theme of most of the contents of the January number of *Landscape Architecture.*

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Hilderic Friend, Great Britain's authority on plant lore, is now running a series of articles on "Herbs and Herbalists," the fourth number of which appeared January 20 in *The Gardeners' Chronicle.* Edward K. Balls began a series of articles on "Plant Hunting in Persia" in the issue of January 6.

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"Studies of Occurrence and Transmission of Virus Diseases in the Genus Abutilon" appears under the authorship of John Y. Keur in the February *Bulletin of the Torrey Botanical Club.* Research on this problem was carried on at The New York Botanical Garden.

In the same issue, an article by Dr. E. D. Merrill on the "Significance of the Compiler's Data in Field Work" leads the reports of a symposium on objectives and methods which took place before the systematic section of the Botanical Society of America in Atlantic City in 1932.

How the Poulsen roses have been developed in Denmark in the last quarter century is told by their originator, Svend Poulsen, in *The New Flora and Silva* for January.

A series of articles on the food requirements of different genera or groups of plants is started in the same issue with an article on lilies by A. Grove.

Camillo Schneider contributes illustrations and descriptions of mock oranges.

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In the January 15th *Journal of the Washington Academy of Sciences,* Dr. Marshall A. Howe identifies Hawaiian algae collected by Dr. Paul C. Galtsoff, and E. P. Killip writes on new plants, mainly from western South America.

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Today's interest in herb gardens and in the wealth of stories that surround these early-cultivated plants is evidenced anew in magazines each month. In the January *Bulletin of the Garden Club of America,* Antoinette Dwight writes entertainingly under the title, "As to Herbs." Among other attractions of this issue are "Caribbean Ports" by Alfred and Elizabeth Kay, "Pentstemons for our Gardens" by Kathleen N. Marriage, and "Potted Plants for House and Garden" by Elizabeth A. Izard.

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Amateurs interested in the identification of grasses may be helped by Technical Bulletin 32 of the Experiment Station of Kansas State Agricultural College, prepared by E. F. Copple and A. E. Aldous. While the grasses described are natives of Kansas prairies, the illustrations of parts of the plants should be helpful for general classification in any region.

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The effects of increased and decreased light on flowering plants in a greenhouse is the subject of Alex Laurie and G. H. Poesch in Bulletin 512 of the Ohio Agricultural Experiment Station. Illustrations show the results of tests made with varying hours of light, as compared with the hours of natural daylight of the season. Recommendations for hours of light suitable for different plants are given.

The 1933 edition of *The American Rose Annual* is now in the library of The New York Botanical Garden. Published by The American Rose Society, it has been edited by J. Horace McFarland and G. A. Stevens.

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Part 3 of volume III of A. J. Grout's *Moss Flora of North America* has recently appeared.

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"Our Familiar Island Trees" by Mary Dillingham Frear gives popular descriptions, photographically illustrated, of the native and cultivated woody plants of Hawaii.

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Ruth E. Ashton is the author of "Flowers of Rocky Mountain National Park," a well-illustrated volume presented by the National Park Service, containing an interesting introduction of an ecological nature.

CAROL H. WOODWARD.

LECTURES SCHEDULED FOR MARCH, APRIL, AND MAY

Saturday afternoons at 3:30, during the spring months, the following free lectures will be delivered in the lecture hall of the Museum Building at The New York Botanical Garden. They will be illustrated by lantern slides and otherwise, and will close promptly at 4:30 p. m.

March 3. "Wild Flower Protection and Cultivation," Mr. P. L. Ricker, President of the Wild Flower Preservation Society.

March 10. "Flowers Through the Year at The New York Botanical Garden," Dr. Forman T. McLean, Supervisor of Public Education.

March 17. "Plants of Hawaii," Mr. Otto Degener, The New York Botanican Garden.

March 24. "Czecho-Slovakia," Dr. H. A. Gleason, Head Curator.

March 31. "Beautiful Gardens of United States and Germany," Mr. Henry Teuscher, Dendrologist.

April 7. "Gardening in Spring," Mr. T. H Everett, Horticulturist.

April 14. "Beverages: Plant Sources and Uses," Dr. Ralph H. Cheney, Long Island University.

April 21. "Sex and Hybridization in the Moulds," Dr. B. O. Dodge, Plant Pathologist.

April 28. "Spring Wild Flowers," Dr. John Hendley Barnhart, Bibliographer and Administrative Assistant.

May 5. "Swiss Botanical Gardens," Professor M. A. Chrysler, Rutgers University.

May 12. "Jamaica: Its Flora and Scenery," Dr. Marshall A. Howe, Assistant Director.
May 19. "Colorado, Wyoming, and South Dakota," Dr. Fred J. Seaver. Curator.
May 26. "Daylilies," Dr. A. B. Stout, Director of the Laboratories.

NOTES, NEWS, AND COMMENT

Professor Tracy E. Hazen, of Barnard College, Columbia University, is the new President of the Torrey Botanical Club.

Dr. E. J. Schreiner, of the Oxford Paper Company, spent two weeks at The New York Botanical Garden in January.

The Garden is indebted in Miss Rosina C. Boardman, of Huntington, Long Island, for the presentation of a collection of 443 water-color paintings of native plants executed by her. These paintings form an important addition to the resources of the institution. A number of them are being exhibited until March 3 in the main lobby of the Museum Building.

At the regular monthly conference of the Scientific Staff and Registered Students of the Garden, held on January 11, 1934, reports of the scientific metings held in Cambridge and Boston during the Christmas holidays were presented by the following members of the staff: Dr. B. O. Dodge, Dr. H. A. Gleason, Dr. M. A. Howe, Mr. Harold N. Moldenke, and Dr. Fred J. Seaver.

On February 15, Gladys P. Anderson spoke on "Phylogenetic Trends in Lichens" and Dr. S. M. Pady on "The Reduction Division in Two Fern Rusts."

F. D. Chester, at one time plant pathologist and bacteriologist at the Delaware Agricultural Experiment Station, is carrying on research work on the host parasite relations of the Dutch elm-disease in our laboratory. This work is being done under the auspices of the C. W. A. Mr. Curtis May has general charge of the research work on the Dutch elm-disease in this vicinity. The latest reports are that an elm tree infected with this disease has been found at 183rd Street near Third Avenue, New York City.

As the official organ of the newly formed Mycological Society of America, *Mycologia* has just closed the most successful year of its

history. Under the new regime the income for this journal has been increased more than eight hundred dollars, most of which has been absorbed in the enlargement and improvement of the journal, which now ranks as one of the most outstanding mycological periodicals in the world. Most of this has been brought about through the loyal support of the members of the Mycological Society, which now number more than three hundred. An equally successful year is anticipated for 1934.

A large quantity of seed of *Pinckneya pubens,* the Georgia bark, a relative of the Cinchona tree, has been received at The New York Botanical Garden through the courtesy of Prof. J. R. Stokes, of the Georgia State Womans College at Valdosta, Ga. This plant forms a shrub or small tree 15–20 feet tall. The flowers are greenish with purple streaks; one calyx-lobe of each of the outer flowers of the large cluster is enlarged into a bright rose-colored bract 2–4 inches long and 1 -3 inches broad. This plant, native of coastal-plain swamps from South Carolina to Florida, is not hardy in the north, but must be grown in the greenhouse. Those desiring seed may obtain it by writing to The New York Botanical Garden.—*E. J .Alexander.*

Mr. B. A. Krukoff has returned from his fourth expedition into Brazilian Amazonia after an absence of about nine months, bringing with him a collection of more than fifteen thousand herbarium specimens and several thousand samples of Brazilian woods. The herbarium material will be distributed by The New York Botanical Garden, while the woods will be studied and distributed by the New York State College of Forestry. Mr. Krukoff collected principally along the tributaries of the Purus and Jurura rivers, near the boundary between Amazonas state and Acre territory, largely in regions never before visited by a botanist. It is believed that his collections will be found to contain many kinds of plants entirely new to botanical science.

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* Member also of the Advisory Council.
‡ Chairman of the Advisory Council.
‖ Secretary of the Advisory Council.
§ Treasurer of the Advisory Council.

GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a beautiful rose garden, a rock garden of rock-loving plants, and fern and herbaceous gardens.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of narcissi, daffodils, tulips, lilacs, irises, peonies, roses, lilies, water-lilies, gladioli, dahlias, and chrysanthemums; in the winter displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 43,400 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be sent to

THE NEW YORK BOTANICAL GARDEN
BRONX PARK, NEW YORK, N. Y.

VOL. XXXV APRIL, 1934 No. 412

JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

ANNUAL REPORT OF THE DIRECTOR FOR THE YEAR 1933
E. D. MERRILL

TREASURER'S REPORT FOR THE YEAR ENDING DECEMBER 31, 1933

CALIFORNIA WILD FLOWERS EXHIBITED BY THE GARDEN AT THE INTERNATIONAL FLOWER SHOW
FORMAN T. MCLEAN AND CAROL H. WOODWARD

NOTES ON THE GARDEN'S ADDITIONAL DISPLAYS
CAROL H. WOODWARD

NOTES, NEWS, AND COMMENT

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Free to members of the Garden

THE NEW YORK BOTANICAL GARDEN

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Until 1935: L. H. Bailey, Thomas J. Dolen, Marshall Field, Mrs. Elon Huntington Hooker, Kenneth K. Mackenzie, John L. Merrill (*Vice-president and Treasurer*), and H. Hobart Porter.

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JOURNAL
OF
The New York Botanical Garden

VOL. XXXV APRIL, 1934 No. 412

ANNUAL REPORT OF THE DIRECTOR FOR THE YEAR 1933*

THE BOARD OF MANAGERS,
THE NEW YORK BOTANICAL GARDEN:

The following summary report of the operations of The New York Botanical Garden for 1933 is submitted for your information.

In spite of the continued economic depression and in spite of a radical reduction in our income of about $74,000 (17%) as compared with 1932, or $90,000 (20%) as compared with 1931, we have, by strict economy, been able to close the year without a deficit. Most of this decrease in income is the result of reductions in our appropriation by the City of New York. There has been relatively little loss in income from investments in the past three years, indicating a very conservative investment of our endowment funds, the book value of which now totals $2,420,676.

During the year our permanent endowment funds were increased by $3,140 by gift, while unrestricted gifts for current expenditures amounted to $410, and restricted gifts amounted to $1,942. While the aggregate of these gains is comparatively small, amounting to about $5,500, yet the gifts were particularly significant, coming as they did in this, the fourth year of a disastrous economic depression.

* No report was published covering the year 1932. Previous annual reports were published in the BULLETIN OF THE NEW YORK BOTANICAL GARDEN. This abbreviated report is a slight amplification of the one presented to the annual meeting of the Board of Managers, January 8, 1934.—Ed.

New Activities

1. The Rock Garden

Essential activities, thanks to the cordial coöperation of most staff members, have been maintained, important innovations have been initiated, and those commenced in 1932 have been maintained and increased. These include the active and most satisfactory development of the new Thompson Memorial Rock Garden, actual work on which was commenced in November, 1932, with very limited funds. In this project, planned to cover about 50,000 square feet, actual construction of approximately 25,000 square feet has been completed at the very low rate of about 35 cents per square foot, and much of the completed area has been planted. This development forms the largest and most comprehensive planting of its type in any public institution in the United States and promises to be a mecca for the numerous people interested in rock gardens and in rock-garden plants. The location at the north end of the glade, east of the Museum Building, is ideal and the progress to date has received the enthusiastic approval of numerous rock-garden experts. The project should be largely completed during 1934.

2. Exchange Seed-list

For the first time in the history of the institution an exchange seed-list was prepared and issued in December, 1933, including about 500 items, many of which represent species rare in cultivation and not previously offered in exchange seed-lists. This offers us the opportunity of securing desirable exchange material from several hundred institutions in various parts of the world and of equalizing our seed exchange accounts with a considerable number of institutions from which similar material has been received in past years.

3. School for Gardeners

The instruction courses for professional gardeners initiated in the fall of 1932 have been continued into the second year, the lectures being given on Monday nights of each week at the rooms of the Horticultural Society of New York. The total enrolment for 1932–33 was 70, while that for the second year, first semester, is 58. These courses meet a real need and should be continued as a

service to our own younger gardeners and to the numerous professional gardeners and estate superintendents in the vicinity of New York City. This activity forms the most significant innovation in the field of public instruction during the history of the Garden.

For the first time in over fifteen years the Garden entered an exhibit at the International Flower Show in March, 1933, and in November a special non-competitive display of chrysanthemums was installed at the Fall Show of the Horticultural Society of New York, for which a special silver medal was awarded.

4. In the Conservatories

The innovation of maintaining a special display conservatory in Range 1, showing well-grown decorative flowering plants in mass during the winter of 1932 33, which is being continued this winter, has met with much very favorable comment and has greatly increased the winter attendance at the conservatory. We have had the cordial coöperation of numerous firms and individuals who have supplied living material which has been of great value to us in maintaining attractive plantings.

The entire central part of the succulent house shows the result of a worthwhile departure from the old method of cultivation in tubs and pots. The plants are now growing naturally and the "rock garden effect" setting adds scenic value to the display. Many changes have been made in the collections of ferns, cycads, begonias, orchids, aroids, bromeliads and in other groups in both ranges, but many more must be accomplished before we can get our extensive collections of living plants into better condition. In certain groups, particularly the cacti, and the bananas and allied groups, the elimination of tubs and pots is clearly desirable, for these plants will thrive infinitely better planted out as we have treated the succulents, rather than being maintained as plants which are often pot-bound and more or less stunted, as is now the case. Although many duplicates have been discarded, we have as yet only made a fair start on the elimination of duplication that still exists in certain groups.

5. Horticultural Exploration in the Southeast

With the financial support of 27 individuals and organizations in England and in the eastern United States, it became possible for

us to send a botanical-horticultural expedition into the southern Appalachian region, August 23 to October 13, 1933, which resulted in the collection of a considerable number of living plants of horticultural promise and about 370 seed numbers, the most desirable of which were reserved for distribution to the patrons who supported the syndicate. This is the first expedition of its kind ever sent out by the institution and it is hoped that it is the forerunner of numerous similar expeditions that may be sent out in the future in our attempt to make the institution of greater service to horticulture. Staff members taking part in this expedition were Mr. T. H. Everett and Mr. E. J. Alexander, assisted by Mr. Stanley Pearson, a volunteer student gardener.

It is safe to state that none of these new activities could have been initiated and consummated on the basis of our staff as it was comprised up to the middle of 1932. The gains that we have been able to make in new fields well offset losses we have sustained through the necessary curtailment of other activities because of radical reductions in operating income and the loss of several staff positions.

6. Aquatic Exhibit

Thanks to the personal interest and financial support of Mr. Stanley Ranger, a member of the corporation, a unique exhibit, the first extensive one of its kind, we believe, in the United States, was established in December on the mezzanine floor of the main stairway in the Museum Building. This consists of 40 aquaria, equipped with thermostats, in which are exhibited about 60 different species of aquatic plants. The exhibit is primarily one of authentically named aquatic plants, although in many of the aquaria a certain number of tropical fish are maintained in order to help maintain a proper biological balance.

7. Shade Tree Conference

On September 7–9, 1933, the Ninth National Shade Tree Conference was held at the Garden with an enrolled attendance of 200, the sessions being most successful. During the year office space was provided for the Federal employees assigned to this region on the Dutch elm-disease control work.

8. Plant Forms in Ornament

From May to September, 1933, the Garden, in association with the Brooklyn Botanic Garden, coöperated with the Metropolitan Museum of Art in installing and maintaining the living plants necessary in connection with the latter institution's exhibit of plant forms as a basis of design in ornament. The registered attendance at the exhibit was about 100,000 and it attracted much favorable comment. In connection with this exhibit, the Garden loaned to the Metropolitan Museum 37 volumes selected from our library to represent the earlier types of botanical illustrations, herbals, and other similar works, for exhibition in its department of prints. This forms an excellent illustration of institutional coöperation in making a very specialized exhibit outstandingly successful.

Charter Changes

During the 156th session of the New York State Legislature (Laws of 1933), the charter of The New York Botanical Garden was amended, one of the changes being the elimination of the Scientific Directors.* Another important one enables the institution to own and control property outside of the City of New York.

Staff Changes

During the year the institution lost by death the services of two of its oldest employees. Dr. Arthur Hollick, Paleobotanist, with 32 years' service, died on March 11, 1933, at the age of 76 years. Mr. John H. Finley, Foreman Gardener, with 34 years' service, died on June 11, 1933. Biographical notices regarding both appeared in our Journal.

Dr. A. C. Smith, Assistant Curator, was granted a year's leave of absence, effective August 1, to enable him to accept a Bishop Museum Fellowship in Yale University for a year of field work in Fiji. To fill the vacancy thus created, Mr. Harold N. Moldenke received an appointment as an Assistant Curator for one year.

To meet our heavy budget reductions, further reductions in sal-

* Copies of this document as amended, and of other papers pertaining to the relationship of the Garden to the City of New York, appear in this Journal for February, 1934. Ed.

aries had to be made in February, supplementing those made in the previous years, and we were unfortunately forced to dispense with the services of one Associate Curator, one janitor, one driver, one clerk, four gardeners, and four laborers, and several minor positions. Vacancies caused by the deaths of Doctor Hollick and Mr. Finley were not filled, as a further measure of economy.

Buildings and Grounds

Essential repairs to buildings have been made as necessary, some being of a temporary nature due to our present exigencies as to funds and labor. These include repairs to Conservatory Range No. 1, especially houses 4 and 6; replacement of part of the main steam line to the Museum Building, and the steam line at Conservatory Range No. 2; water-proofing of both extending pier walls on the northwest wing of the Museum Building and repairs to the Museum Building roof; the much needed renovation of some of the paths; the reconstruction of the Museum Building delivery road; the construction of four brick cold-frames 6 feet wide and 31 to 40 feet long in the propagating grounds; and the removal of many of the older and obsolete plantings in the propagating grounds.

In 1933 the office of the Borough President completed the retaining wall along Bronx Park East at the northern part of our grounds necessitated by the widening of Bronx Park East. This rubble masonry wall is about 1177 feet long, and averages about 25 feet high. Unfortunately a part of the wall was not properly constructed, resulting in an extensive cave-in in August, 1933, so that about 450 feet of this wall is now being reconstructed. Farther south on Bronx Park East the Park Department is now actively engaged in building the permanent masonry wall along our property line opposite the Propagating House and grounds. This beautifully constructed wall is about 1000 feet long, and opposite the Propagating House the stone wall is 14 feet high, but in other parts it is lower, depending on the topography of the Garden terrain; this new wall will be topped throughout its length by an iron fence.

The Park Department has also replaced our permanent iron and stone boundary fence which had to be removed when Bronx Park East was widened several years ago, the total length being 2738 feet. These improvements place us in a position to proceed with the general rehabilitation of the Allerton and Waring Avenue en-

trances and the grounds contiguous to Bronx Park East which have been in a most unkempt condition for the past four or five years, because of the inability of the Street and Park Departments to complete their own programs.

Outside Plantings

Seasonal displays of showy ornamentals have been successfully maintained. The extensive plantings of iris, daffodils, cannas, dahlias, chrysanthemums, roses, peonies, and other plants have been increased, and we have been able to give them better attention. The perennial border, established by the Advisory Council, thanks to this organization's continued coöperation and support, has been maintained as a most attractive addition to our ornamental plantings, and its attractiveness continues to have its reflex in the conspicuous improvement of the other borders through the inspiration it has been to our own gardeners.

Extensive gifts of cuttings of *Calluna, Erica, Sedum,* and other plants from Mr. Clarence Lewis, a very large number of rare shrubs and various rock-garden plants from the Boyce Thompson Arboretum, a collection of palms and cycads from Col. Robert Montgomery, 140 orchid plants from George Baldwin & Company, 47,600 tulip and hyacinth bulbs from the Dutch Bulb-Exporters' Association for next year's display, cuttings representing 140 species and varieties of conifers not included in our living collections, from the Arnold Arboretum, Colonel Montgomery, and other sources; more than 500 roses from Messrs. Bobbink & Atkins; about 700 packets of seeds selected and purchased by Mr. Stanley Ranger; numerous cannas, iris, dahlias, chrysanthemums, peonies, and other plants represent some of the more important gifts of plant material received during the past year. Donors of this material include also W. E. Marshall & Co., Walter Barnwell, Burnett Brothers, A. L. Don, William A. Hunt & Co., H. J. Ohms, John Scheepers, Max Schling, Stumpp & Walter, Sutton & Son, Charles Torrey, J. C. Van Bourgondien, A. E. Wohlert, John C. Wister, Henry A. Dreer & Co., Robert Pyle, Mrs. W. H. Peckham, and the Yokohama Nursery Co.

The new naturalized plantings of Narcissi established by Mrs. Peckham on both sides of the main drive through the Pinetum east and north of Range 1 in June, 1932, made their first showing last

spring, and from now on there will be a rapid increase in these attractive spring flowers, so that within a few years we shall have another large area of naturalized Narcissus, supplementing the extensive plantings in the southwest corner of the grounds.

About 3000 *Rhododendron* and *Azalea* seedlings are being grown to be used ultimately for mass plantings along walks and drives, and in the borders of the forested areas. Several thousand plants are being grown in the propagating grounds for the Thompson Memorial Rock Garden.

The *Hemerocallis* and Louisiana *Iris* plantings back of the Museum Building have been extended and a small but representative display planting of *Hemerocallis* species and derived hybrids has been established on the slope west of the building. Several thousand discarded hybrids have been planted in various parts of the grounds and presented to friends of the institution for naturalistic plantings. Numerous new crosses have been made and many thousands of hybrid seedlings are now being grown.

Selective breeding and hybridization of Louisiana *Iris* commenced in 1932 has been continued, and a large number of seedlings should bloom in 1934.

Library

The library was increased by 1012 bound volumes, these representing purchases, gifts, exchanges, and bindings, the latter chiefly periodicals. The total number of bound volumes is now 43,429; 461 volumes having been returned to Columbia University during the year. There are still about 4600 volumes of the Columbia University deposit on our shelves. Eight new periodicals were acquired by exchange during the past year. The use of the library by students and research workers not connected with the Garden shows a steady increase. Our inter-library loan proposition, as approved by the Scientific Directors, has been accepted by seven institutions in Greater New York.

Herbarium

For the first time in the history of the institution I am able to present accurate statistics on the extent of the reference collections. Thanks to the assistants assigned to the Garden by the Emergency Work Bureau, we were able to consummate a census of the her-

barium during the year. The statistics, including accessions up to December 1, 1933, are as follows:

1. General herbarium, flowering plants and ferns		1,043,744*
2. Local herbarium	58,606	
3. Horticultural herbarium	18,996	
4. Fungi	251,674	
5. Hepaticae	55,412	
6. Algae	76,530	
7. Mosses	167,812	
8. Mosses (local)	3,799	
9. Lichens	29,775	
		662,604
Total		1,706,348

This important reference collection, particularly rich in historical material, is exceeded in size in America only by the United States National Herbarium in Washington, D. C.

During the year the reference collections were increased by the actual mounting and incorporation of 44,084 specimens and photographs, of which 8,885 are photographs or types of historical specimens in various European and American herbaria; about 8,000 of these represent Chinese species in the Kew herbarium received in exchange from the Fan Memorial Institute of Biology. Current accessions as yet unorganized and only in part mounted approximate 20,000 additional specimens. This material is received in exchange, by collection, as gifts, by purchase, and for identification. It is significant that no less than 9,268 specimens were received in return for identifications, such material coming from various parts of North, Central and South America, the West Indies, Sumatra, China, Indo-China, Hainan, the Philippines, Borneo, New Guinea, the Caroline and Marianne Islands, the northwestern Himalayan region, Tibet, Siam, and Polynesia. We are indebted to Dr. H. Bassler for the deposit of his extensive set of duplicates of the important collection made by G. Tessmann in eastern Peru. The F. W. Johnson herbarium, presented early in the year, is especially rich in material from western New York but contains specimens from many parts of Canada, the United States, Mexico, and the West Indies.

*Of these 177,820 are segregated in the oriental herbarium; 7,700 is the approximate number on loan to other institutions.

During the same period 10,583 duplicate specimens and 3,205 photographs of types were sent to other institutions on our general exchange accounts. Publications to the equivalent of 2,495 specimens were also sent out in exchange for botanical material.

The reorganization of the entire general herbarium, arranging the specimens under certain geographic areas, was completed during the summer. The plan involved the adoption of a combined genus-species cover system, and to make these great collections more generally useful the plan of clipping or typing original descriptions and original notes and pasting them on the specimen covers in juxtaposition with the actual specimens has been extended. Since this work commenced, several hundred thousand of these items have actually been distributed into the herbarium, in consummation of what may be called the incorporation of basic library data in the herbarium. It was only through the circumstances by which the Garden was granted a large amount of temporary assistance by the Emergency Work Bureau that it was possible for us to initiate and prosecute this work, which has vastly increased the value of our reference collections, and which greatly facilitates the work of all botanists who have occasion to consult our material. The New York Botanical Garden is the only institution in the world where this plan has been followed out on a comprehensive scale. There have been some objections raised as to the geographic segregations adopted, but its advantages infinitely outweigh its disadvantages.

During the year 82 loans, Nos. 45 to 126 inclusive, were made to institutions in Europe, Asia, and America, totaling 8,159 herbarium sheets. Incoming loans for the use of our own staff members totaled 49, with 4421 sheets from 19 different institutions in Europe and America.

Algology

Doctor Howe, Assistant Director, has continued his studies of marine algae, giving special attention to those of Porto Rico, and has prepared for publication a report on the Eocene lime-secreting algae that were largely responsible for the up-building of an extensive deposit of limestone now 3000 to 4000 feet above the sea in Santa Barbara County, California. He has continued the supervision of the Garden's collection of living dahlias, the October display being particularly attractive.

Mycology

The work in this division has been prosecuted about as in previous years. Much attention has been given to the reference collections, the incorporation of new material, and the general arrangement of material. Doctor Seaver of necessity has to devote much of his time to matters pertaining to his editorship and business managership of *Mycologia,* which has been considerably increased in size as its increased subscription list has provided more funds for the publication of papers coming within its field.

Bryology

The routine work in this division has been carried on by Mr. Williams, consisting largely of making current identifications of material sent for determination and the incorporation of such material in the reference collections.

Plant Pathology

The practical work and research in this department have been prosecuted as in previous years. The work on the blackspot of roses has been successfully continued and the better understanding of the life history of the causative organism may lead to more practicable control measures. Fungicide studies are being continued on the control of many diseases. Requests for information and assistance constantly increase.

The control of insect pests, in the absence of a trained entomologist, falls to this department. The Japanese and Asiatic beetles are slowly increasing in numbers but so far we have been able to cope with them. Three insect pests, hitherto not requiring attention, appeared in numbers during the year: the elm leaf beetle, the fall canker worm, and the elm bark beetle. The last is the carrier of the Dutch elm-disease fungus from diseased to healthy trees, but a careful survey of the elm trees in the garden has so far not shown this disease to be present, although diseased elms have been found in rather large numbers in New Jersey, Long Island, and in Westchester County. We thus face the menace of an outbreak of this fatal disease of the elm which, if once established, may be as fatal to our elm trees as was the chestnut blight to our chestnut trees some years ago.

Laboratories

Plant breeding has largely been concentrated on *Hemerocallis* and *Iris* hybrids, many thousands of plants now being grown. In the seedless grape breeding project in coöperation with the Geneva Experiment Station, forty seedless varieties have been obtained, including those that first fruited in 1933. Those which possess merit are being propagated at Geneva for cultural trials. The coöperative lily investigations have been continued, the Yokohama Nursery Company aiding to the extent of supplying 600 lily bulbs for experimental and display purposes. Selections of pedigreed hybrid poplars donated by the Oxford Paper Company have been planted along the paths bordering the lowlands in the north end of the Garden.

Registered Students

Our coöperative work with Columbia University has continued as in previous years. At the close of the last academic year Messrs. A. C. Smith, J. Y. Keur, and E. L. Core, registered students at the Garden, successfully passed their final examinations for the degree of Ph. D. at Columbia University. During the year our coöperative agreement with Columbia University was slightly modified to the mutual benefit of both institutions. The registered students and their special fields were as follows:

Acuna, Julian—Studies of *Dioscorea.*
Aronescu, Alice—Plant Pathology.
Backus, Dr. Myron Port—Plant Pathology.
Barrows, Florence Louise—Research in Sterility.
Butler, Ellys Theodora—Mycology.
Core, Earl Lemley—Taxonomy.
Keur, John Yak—Virus diseases in *Abutilon.*
Fulling, Edmund Henry—Taxonomy.
Koch, Dr. Minna F.—Scholarship in Morphology.
Le Vann, Leon Volunteer assistant in Cytology.
Moldenke, Harold Norman -Taxonomy.
Pady, Dr. S. M.—National Research Scholarship.
Saitta, Joseph—Scholarship in Pathology.
Schweizer, Ola—Scholarship in Plant Breeding.
Sherman, Lillian, Volunteer assistant in Cytology.
Smith, Albert C.—Taxonomy.

Public Education

The school for professional gardeners, now in its second year, has an enrolment of 58, of whom 22 are registered in the first year, the 36 others having completed the first year's work in 1932–33. These classes are being held at the rooms of the Horticultural Society of New York through the coöperation of that organization. Another coöperative organization is the National Association of Gardeners. Extension gardening courses for adults have been continued, the registration being limited by the space that can be allocated to this work in the Propagating House. Forty-one Saturday afternoon lectures on botanical and horticultural subjects were given during the year in the auditorium, of which thirty were by staff members, with a total attendance of 4,079. Eight winter gardening demonstrations were given with a total attendance of 711. Guidance for special organizations and schools served somewhat over 4,000 individuals.

Publications

Sales of publications amounted to about $6,234. This clearly indicates a continuous demand for the technical and popular publications of the Garden, the relatively small decrease in comparison with receipts for 1932 being largely due to the fact that no new numbers of the *North American Flora* were issued during the year. Effective January 1, 1933, our periodical *Mycologia* was made the official organ of the newly organized Mycological Society of America, the net result being a considerable increase in receipts from the subscriptions and sales of this magazine. No annual report was issued for 1932–33, but the Journal was issued regularly. Number 4 of *Brittonia* appeared in December, and another number is in press. It is highly desirable that more numbers of this periodical be issued to provide a medium for the publication of technical papers by staff members. Because of our reduced income it was decided to issue but two numbers of *Addisonia* each year instead of the usual four numbers, completing a volume in two years instead of one. As a further measure of economy our series of *Contributions* has been temporarily suspended.

There seems to be little prospect of issuing additional numbers of the *North American Flora* in the near future unless additional manuscripts are received. During the year successful negotiations

were consummated with Dr. A. S. Hitchcock for continued work on the Gramineae, his last contribution being received in 1915, but not published until 1932. Mr. Paul C. Standley has again taken up work on the Rubiaceae, his last contribution being published in 1921. Work is being prosecuted on other families by Dr. Mildred Mathias (Umbelliferae) who reports completed manuscript on 199 species and a preliminary study of 210 additional ones. Negotiations have been continued with Messrs. Johnston, Epling, Mason, Coker, Martin, and Gilkey for work on groups in which they are especially interested. It is a moot question as to whether or not we should attempt to push this work much faster at the present time in justice to our subscribers, many of whom find it difficult to maintain their subscriptions. In any case, because of the reduction of our technical staff, particularly in the loss of Doctor Rydberg, and for other causes, we are at present dependent largely on contributions from botanists connected with other institutions who, with the exception of Doctor Mathias, do the work without compensation from the Garden, except the nominal amount paid per printed page as parts are issued.

Many technical and popular papers have been published by staff members in periodical literature, but the bibliography is here omitted. Late in the year Dr. Small's "Manual of the Southeastern Flora" was issued, forming a volume of xxii + 1554 pages illustrated by more than 1500 text figures. This was published by the author and is a descriptive flora covering all of the known native and naturalized species of flowering plants growing in the area from North Carolina and Tennessee to Mississippi and Florida.

Emergency Work Bureau Relations

The institution has continued its full coöperation with the Emergency Work Bureau in providing work, particularly for women, for individuals assigned to the Garden by that organization. The maximum number at any one time was 132 in the late spring. This number was gradually reduced until September when, because of exhaustion of funds, all but five or six were removed. Two weeks later it became possible to commence the re-instatement of these workers, and our assignments were gradually increased until at the end of the year about 65 were employed. Most of them are assigned four days a week.

In addition to the temporary women employees, special funds were granted from the City relief appropriation, giving us 40 men in two shifts on alternate weeks for outside work. In December, when the Civil Works Administration was organized, we secured the additional assignment of outside laborers; the total in this group at the end of December was 90 individuals.

Through this temporary help it has been possible for us to accomplish a vast amount of work that would otherwise have to remain undone because of our financial limitations. This plan of "made work" relief adopted by the Emergency Work Bureau, working through non-profit institutions, has more than any other factor enabled us to maintain various lines of work, and to initiate work on numerous new projects. The New York Botanical Garden is deeply indebted to the Emergency Work Bureau for the assistance it has been able to grant this institution during the past three years. It is true that the organization and control of this small army of temporary assistants has entailed heavy burdens on our small staff in planning and supervising projects and in training numerous individuals to work in fields in which they had no previous experience, but the returns in routine work accomplished from an institutional standpoint amply repay for all the time and effort expended by members of our staff.

Memberships

The Committee on Patrons, Fellows, and Members, reports 27 additional new members. The loss by resignation and by death is however 216, a net decrease of 189 members during the year, a decrease directly correlated with the prevailing adverse economic conditions.

There are at present 101 Life Members, 3 Fellowship Members, 106 Sustaining Members, and 1377 Annual Members. It is sincerely hoped that we are at about the end of our decline in memberships, as the income from membership fees is an important source of revenue for the support of our various activities.

Gifts

The very numerous gifts of seeds and living plants received during the year have been mentioned above. In addition to these,

numerous important accessions have come to the Museum and the library as gifts, as in previous years. One unusual special gift was a collection of 443 water-color paintings of plants prepared and presented by Miss Rosina C. Boardman, of Huntington, L. I. An unsolicited gift of $1,000 came from a donor who wishes to be anonymous, for the support of *Mycologia*. This has been designated as a special endowment, the income to be used for the promotion of that magazine. A fund totaling $2,014.70 was received from the Wild Flower Preservation Society of America under the agreement that this should be added to the Olivia E. and Caroline Phelps Stokes Fund, the income to be used in furthering the protection of native wild flowers.

Honors

Honors continue to be granted to our staff members. In December Doctor Howe was elected President of the New York Academy of Sciences; Doctor Dodge was elected a member of the National Academy of Sciences, Washington, D. C., last April, giving the Garden four of the twenty-one botanists among the members of this restricted body. Doctor Dodge was also elected Vice-President and Chairman of Section G (botany) of the A. A. A. S. at its annual meeting in Boston in December. In June I was elected a foreign member of the Linnean Society, London, these being restricted to fifty, and in December was elected President of the Botanical Society of America at its annual meeting in Boston.

Conclusion

Because of the prevailing economic conditions, I make no recommendations covering possible expansion of our activities. My hope is to be able to maintain what we now have, improving and enlarging our activities as it becomes possible for us to do so. The scientific staff cannot safely be reduced much below its present number, its output having already been greatly restricted through the deaths of Doctor Rydberg and Doctor Hollick. The City emergency regulations, unfortunately for us, make difficult the filling of any position that may become vacant for any reason, and through the operation of this regulation we have already lost several City positions and unless a change be made by the new administration

will lose others in the near future. A reduction of $13,230 in the City budget for 1934 already approved will most seriously handicap the institution, particularly in the general labor field and in supplies, especially coal; further reductions in the City budget are to be expected.

We should strive to maintain our position in the scientific field, and to continue to improve both our inside and outside ornamental plantings, on which a good start has been made. No matter what changes are made in policies, in objectives, and in methods, not all of them will be acceptable to everybody. There has been some passive and some active resistance to any changes in the order of things as they were in previous years. I am very definitely of the opinion that, if progress is to be made along the lines in which the majority of this Board are interested, certain changes are inevitable. It is manifest that, with a reduction in income of $74,000 (17%) for 1933 over 1932, and $90,000 (20%) over that of 1931, with a further reduction of $13,230 in the 1934 City budget, our financial situation is extremely critical. It is manifestly impossible for us to operate all departments on the scale of previous years. To meet the critical situation that the Garden faces at this, the close of the fourth year of the depression, I bespeak the harmonious support of all who have the best interests of the Garden at heart.

E. D. MERRILL.

NEW YORK, N. Y.,
JANUARY 1, 1934.

TREASURER'S REPORT FOR THE YEAR ENDING DECEMBER 31, 1933

EXHIBIT I

BALANCE SHEET

December 31, 1933

JOHN L. MERRILL, Treasurer

ASSETS

Permanent Fund Assets:

Investments at cost or appraisal at time of acquisition (Exhibit III)	$2,420,676.94		
Cash awaiting investment	28,356.31		
		$2,449,033.25	
Balance of permanent fund assets expended for current uses (see current fund liability, per contra)		14,863.99	
			$2,463,897.24

Current and Working Assets:

Cash in banks and on hand:			
For general purposes	$ 1,836.74		
For special purposes	9,100.62		
		$ 10,937.36	
Accounts receivable:			
City maintenance	$ 18,751.12		
Other	826.85		
		19,577.97	
Interest and dividends receivable (Exhibit III)		30,332.05	
Prepaid insurance premiums, etc.		2,016.18	
			62,863.56
			$2,526,760.80

EXHIBIT I

BALANCE SHEET

December 31, 1933

Liabilities

Permanent Funds (Exhibit IV):			
Restricted endowments		$ 201,921.10	
Unrestricted endowments, including bequests set aside by the Board of Managers as permanent funds		2,240,817.32	
Special endowment with life interest in respect of income therefrom		21,158.82	
			$2,463,897.24
Current Liabilities and Special Funds:			
Current liabilities:			
Accounts payable		$ 11,209.76	
Special funds (Exhibit V):			
Unexpended income from restricted funds	$ 5,697.41		
Unexpended contributions set aside by the Board of Managers for specific purposes	3,403.21		
		9,100.62	
Deferred income credits:			
Membership dues paid in advance	$ 160.00		
Subscriptions and fees paid in advance	1,221.12		
		1,381.12	
Balance of indebtedness to permanent funds for expenditures of fund assets for current uses		14,863.99	
Working fund:			
Working fund at December 31, 1932	$ 12,397.27		
Add—Excess of unrestricted income over expenditures for the year ending December 31, 1933 (Exhibit II)	13,910.80		
		26,308.07	
			62,863.56
			$2,526,760.80

To the Board of Managers of
The New York Botanical Garden:

We have made an examination of the balance sheet of The New York Botanical Garden as at December 31, 1933, and of the statement of operations for the year 1933. In connection therewith, we examined or tested accounting records of the Garden and other supporting evidence and obtained information and explanations from officers and employees of the corporation; we also made a general review of the accounting methods and of the income and expense accounts for the year, but we did not make a detailed audit of the transactions.

In our opinion, based upon such examination, the attached balance sheet (Exhibit I) and related statements (Exhibits II–V, inclusive) fairly present its position at December 31, 1933, and the result of its transactions for the year.

Price, Waterhouse & Co.

56 Pine Street, New York, April 12, 1934.

EXHIBIT II

Statement of Operations for the Year Ending December 31, 1933

		Total	Restricted and special funds	Unrestricted
Income:				
Income from investments of permanent funds		$118,484.19	$ 9,403.74	$109,080.45
Contributions:				
City maintenance		214,496.32		214,496.32
Other		2,179.05	1,759.05	420.00
Membership dues:				
Annual		10,090.00		10,090.00
Sustaining		2,200.00		2,200.00
Sales of duplicate books and sundries		1,668 36	1,122.13	546.23
Subscriptions and sales of publications		6,013.82	4,361.00	1,652.82
Total income		$355,131.74	$16,645.92	$338,485.82
Expenses:				
Horticulture:				
Outdoor	$46,593.10			
Indoor	63,980.14			
Propagating house and nursery	14,021.90			
		$124,595.14	$ 1,679.10	$122,916.04
Science and curating:				
Herbarium	$29,718.39			
Research and experiment	12,257.74			
Abstract study	6,172.86			
General	3,380.63			
		51,529.62	3,609.07	47,920.55
Library:				
New books and bindings	4,088.38			
Bibliographic research	2,368.83			
Supervision, assistants, supplies, etc.	6,167.11			
		12,624.32	3,746.32	8,878.00
Education:				
Public instruction and lectures	$11,904.19			
Graduate instruction	1,579.47			
Photography and slides	3,832.32			
Museum collections and exhibits	980.55			
		18,296.53	4,555.74	13,740.79
Publications		12,944.86	5.014.90	7,929.96
Administration		36,554.29		36,554.29
Care and upkeep:				
Grounds	$42,513.18			
Buildings	39,492.67			
		82,005.85		82,005.85
Improvement and equipment purchases		7,029.79	2,400.25	4,629.54
Total expenses		$345,580.40	$21,005.38	$324,575.02
Excess of income over expenses for the year		$ 9,551.34	$–4,359.46	$ 13,910.80

EXHIBIT III

Summary of Investments, December 31, 1933

	Par value (no par value stocks at book value)	Approximate quoted value	Book value	Accrued interest and dividends December 31, 1933	Average yield per year on basis of	
					Quoted value	Book value
					%	%
General funds:						
Bonds ..	$ 554,400.00	$ 489,871.56	$ 545,646.53	$ 7,766.80	5.52	4 96
Stocks:						
Preferred	65,830.00	68,365.00	71,337.50	897.50	6.09	5.84
Common	20,268.80	7,409.50	20,268.80			
	$ 640,498.80	$ 565,646.06	$ 637,252.83	$ 8,664.30	5.52	4 90
Sage fund:						
Bonds	$ 536,000.00	$ 478,845.75	$ 482,233.11	$ 8,648.75	5.18	5.14
Stocks:						
Preferred	155,611.25	156,478.38	164,898.76	991.25	4.94	4.69
Common	73,300.00	120,080.50	101,298.62	1,801.50	7.36	8.77
	$ 764,911.25	$ 755,404.63	$ 748,430.49	$11,441.50	5.48	5.53
Special endowment fund:						
Bonds ..	$ 40,000.00	$ 40,040.00	$ 40,496.00	$ 702.50	5.04	4.99
Stocks:						
Preferred	360,000.00	387,965.63	434,831.88	4,292.50	4.93	4.40
Common	21,400.00	19,012.00	43,709.03	225.00	7.26	3.16
	$ 421,400.00	$ 447,017.63	$ 519,036.91	$ 5,220.00	5.04	4.34
John D. Rockefeller, Jr., fund:						
Bonds	$ 201,000.00	$ 203,966.25	$ 200,760.25	$ 2,312.50	4.93	5.01
Preferred stocks	254,137.50	280,900.00	298,825.01	2,693.75	5.41	5.09
	$ 455,137.50	$ 484,866.25	$ 499,585.26	$ 5,006.25	5.21	5.05
Special trust fund:						
Common stock	16,371.45	10,089.00	16,371 45			
	$2,298,319.00	$2,263,023.57	$2,420,676.94	$30,332.05	5.32	4.97

INVESTMENTS

Summary of Average Yields for Year

	On basis of	
	Quoted value	Book value
	%	%
Bonds	5.27	5.04
Stocks:		
Preferred	5.17	4.77
Common	6.56	5.65
	5.32	4.97

EXHIBIT IV

Statement of Permanent Funds Showing Changes During the Year Ending December 31, 1933

	Balance Jan. 1, 1933	Additions or deductions	Balance Dec. 31, 1933
Restricted endowments:			
Endowment for science and education	$ 89,115.49		$ 89,115.49
Addison Brown Fund	21,149.31		21,149.31
John Innes Kane Fund	35,347.63		35,347.63
Maria De Witt Jesup Fund	25,000.00		25,000.00
Olivia E. and Caroline Phelps Stokes Fund	3,000 00	$2,031.63	5,031.63
Charles Budd Robinson Fund	755.04		755.04
The H. H. Memorial Fund	5,000.00		5,000.00
Alexander P. Anderson and Lydia Anderson Fund	10,000.00		10,000.00
Students' Research Fund	9,412.00	110.00	9,522.00
Endowment for the publication of "Mycologia"		1,000.00	1,000.00
	$ 198,779.47	$3,141.63	$ 201,921.10
Unrestricted endowments:			
Endowment Fund	$ 238,906.56	$3,820.15	$ 242,726.71
David Lydig Fund	34,337.86		34,337.86
William R. Sands Fund	10,000.00		10,000.00
Darius Ogden Mills Fund	48,099.17		48,099.17
Henry Iden Fund	10,000.00		10,000.00
Fanny Bridgham Fund	30,000.00		30,000.00
Francis Lynde Stetson Fund	25,000.00		25,000.00
Russell Sage and Margaret Olivia Sage Memorial Fund	783,924.47	– .26	783,924.21
Frances Griscom Parsons Fund	2,304.67		2,304.67
Special Endowment Fund	519,038.36		519,038.36
The John D. Rockefeller, Jr., Fund	500,000.00		500,000.00
The Charles Patrick Daly and Maria Lydig Daly Fund	19,636.34		19,636.34
The James A. Scrymser and Mary C. Scrymser Fund	12,750.00		12,750.00
The George N. Best Fund	3,000.00		3,000.00
	$2,236,997.43	$3,819.89	$2,240,817.32
Special endowment:			
Special Trust Fund	21,158.82		21,158.82
	$2,456,935.72	$6,961.52	$2,463,897.24

EXHIBIT V

Special Funds

Statement of Application of Income from Restricted Permanent Funds and Special Funds Designated for Specific Purposes

	Balance January 1, 1933	Additions	Expenditures	Balance December 31, 1933
Restricted permanent funds:				
Endowment for science and education:				
Public lectures and instruction, research and publications other than "Addisonia"	$ 373.56	$ 4,182.56	$ 4,281.50	$ 274.62
Addison Brown Fund:				
Publication of "Addisonia"		2,110.52	2,110.52	
John Innes Kane Fund:				
Plant purchases and expenses	2,620.06	1,661.00	1,404.51	2,876.55
Maria De Witt Jesup Fund:				
Botanical collections and binding of books	110.13	1,174.54	1,193.48	91.19
Olivia E. and Caroline Phelps Stokes Fund:				
Investigation and preservation of native plants	628.03	157.08	49.59	735.52
Charles Budd Robinson Fund:				
Exploration	1.21	35.39		36.60
The H. H. Memorial Fund:				
Development of model gardens	4.77	234.91	225.00	14.68
Alexander P. Anderson and Lydia Anderson Fund:				
Research	1,133.87	469.82	712.50	891.19
Students' Research Fund:				
Scholarships and prizes	292.52	442.46	350.00	384.98
Mycologia Fund:				
Publication of "Mycologia"		3,296.46	2,904.38	392.08
	$ 5,164.15	$13,764.74	$13,231.48	$5,697.41
Special funds contributed for specific purposes:				
Contribution of trustees of Carnegie Corporation:				
For public education	$ 3,721.85		$ 3,299.27	$ 422.58
Carried forward	$ 3,721.85		$ 3,299.27	$ 422.58

EXHIBIT V—*Continued*

	Balance January 1, 1933	Additions	Expenditures	Balance December 31, 1933
Brought forward	$ 3,721.85		$ 3,299.27	$ 422.58
Bequest of William Gilman Thompson, designated by executive committee for construction of rock garden	3,977.94		2,400.25	1,577.69
Fees from special bird course		310.00	310.00	
Fees from school for gardeners	379.24	812.13	521.47	669.90
Sale of shares in the Southern Appalachian Expedition		1,331.89	807.70	524.19
Other restricted contributions	216.90	427.16	435.21	208.85
	$ 8,295.93	$ 2,881.18	$ 7,773.90	$3,403.21
	$13,460.08	$16,645.92	$21,005.38	$9,100.62

CALIFORNIA WILD FLOWERS EXHIBITED BY THE GARDEN AT THE INTERNATIONAL FLOWER SHOW

California wild flowers, seldom seen in the East, comprised the principal exhibit of The New York Botanical Garden at the International Flower Show in March. More than 100 species of plants from the foothills, the plains, and the coastal regions were set out on a landscaped slope with Douglas fir trees and Oregon grapes (*Mahonia*) in the background.

The exhibit, which occupied more than 400 square feet, not only attracted attention from the thousands of visitors to the show, but was awarded a special prize of $100 by the International Flower Show Prize Committee, and also a bronze medal from the Garden Club of America for "the great beauty and horticultural value" of the exhibit. Mrs. Samuel Seabury made the presentation of the medal while the show was in progress.

Tall pink-flowered clarkias were used in the background at the left, with some of the leptosynes banked against the first and a few

FIGURE 1. California flowers planted in naturalistic fashion, exhibited by the Botanical Garden at the Flower Show.

others planted in the foreground. At the foot of the bank on the right, a number of bulbous plants were set out in rocky woodland effect. The rest of the plants, including wild larkspurs and lupines, phacelias, and many others, were planted over the slope in naturalistic fashion.

Few parts of the world have as brilliant and varied a native flora as has California. This is not surprising when we recall that the state is about a thousand miles long and extends from snow-covered mountain peaks and high deserts in the east, through semi-arid Center Valley and wet Coast Range to the foggy Redwood Belt along the Pacific and the cactus-covered desert below sea level in the Imperial Valley.

In this wide range of natural conditions, the California wild flowers have diverse requirements, from the sea-shore plants like *Leptosyne maritima* and the sand verbena, *Abronia*, through the valley annuals like the meadow-foam (*Limnanthes Douglasii*, often incorrectly known as *Floerkia*), the California poppies (*Eschscholtzia*), red-cups (*Calandrinia*), larkspurs and lupines, all of which are common in the dry interior valley, where they blossom in the sunny spring after a moist winter and just before the heat of the summer dries them up. In the foothills of the Sierras among the scrub oaks and in the rocky creek-bottoms are some of the most delicate and attractive wild flowers, like the baby blue-eyes (*Nemophila insignis*), the ram's-horns (*Phacelia*), the fritillaries and the farewell-to-spring (*Godetia*). On the sunny slopes of the foothills we also find the finest of the clarkias. In the mountain canyons and meadows, trout, or fawn, lilies (*Erythronium*), shooting-stars (*Dodecatheon*) and wake-robins (*Trillium*) are found in great variety, blossoming almost as soon as the snow melts away.

Some of the most breath-taking displays of wild flowers of California are in the valleys and foothills, where slopes may be covered for miles with great sheets of white, gold, or purple blossoms. The plants of these locations are quick-growing, early-blooming, and ephemeral, either blossoming within a few weeks from seed, or flowering from food stored in their bulbs, with a very short growing season. Many of these are excellent for exposed, sunny gravel banks here in the East, and if given the right conditions may make wonderful displays of blossoms in really very poor locations.

A few of the interesting forms in The New York Botanical Garden's exhibit were gold-fields (*Baeria chrysostoma*), a composite with brilliant yellow blossoms; tidy-tips (*Layia elegans*), a low-growing composite, its daisy-like blossoms with each petal-tip creamy white; the globe gilia (*Gilia capitata*), its heads of lavender-purple blossoms making masses of color in the natural meadows of the California valleys; and the still more striking birds'-eyes (*Gilia tricolor*), its lavender blossoms having purple and yellow markings in the center.

Among the very dainty spring wild flowers are the cream cups (*Platystemon californicus*), the little cream-colored blossoms resembling tiny poppies. Meadow-foam makes a sheet of creamy yellow bloom in the moist meadows in early spring.

Calandrinia Menzicsii is related to *Portulaca* and has equally brilliant purplish-red blossoms. It likes the same kind of a situation as *Portulaca* and will thrive in poor sterile sunny slopes in the early season. Everyone is familiar with the monkey flowers, and there are several fine species from California, among them the yellow one (*Mimulus guttatus*), which grows in the moistest part of the dry foothills. For brilliance in coloring, the little sun-cups (*Oenothera ovata*) perhaps surpass any other flowers with the possible exception of the species of *Leptosyne,* which also grow wild in the California foothills. The blue and white lupines (*Lupinus nanus*) and many other species, both of the lupines and the larkspurs, which occur in the heavier soils of the valleys, may be successfully grown as annuals here in the East.

Many of the valley species of California bulbs are so violently opposed to wet feet during their dormant season in summer and early winter that they are difficult to grow out of doors in the East, but many of these will do admirably in a cold frame or cool greenhouse. Among the finest are the Ithuriel's spear (*Brodiaea laxa*), with its fine lavender clusters of blossoms on slender stalks; and the more robust blue dicks (*Brodiaea capitata*), of deeper violet-purple coloring. The wild onions are a rich and varied crew, as strong in coloring as some of them are in their odor. One of the most robust is *Allium uniflorum* with its lavender-pink heads of blooms, but there are many others. The same may be said of the star tulips (mariposas). *Calochortus uniflorus* is a lilac star tulip. Others are pink, yellow, or white, and of varied size and texture.

The genus *Camassia,* with its loose graceful spikes of blue or white, has already been transported to a few gardens in the East.

In the wooded foothills, where the tenderer plants are protected by shade of oak brush, *Nemophila insignis,* the baby blue-eyes, and *N. maculata,* the spotted nemophila; the wild godetia (*Godetia amoena*); many of the brodiaeas, such as the scarlet one (*Brodiaea coccinea*) and the climbing *Brodiaea volubilis*; and the fritillaries (*Fritillaria pudica* and its relatives) all thrive. Among these the climbing brodiaea is a curiosity because its clusters of flowers are borne on twining leafless stalks which sometimes clamber six or eight feet up to the top of the shrubs which shade its rosette of hyacinth-like leaves at the base.

FIGURE 2. One of the California trout-lilies, *Erythronium californicum,* which bloomed among the rocks in the Garden's display at the International Flower Show. This is one of the western plants which can be successfully grown in eastern gardens.

Going further into the mountains of the Sierras and the Coast Range, in the meadows on the rock ledges at the cooler altitude, one finds the shooting-star (*Dodecatheon Hendersonii*) and its relatives; the fawn lilies (*Erythronium californicum,* and other species); the white and pink trilliums, a number of species of *Mimulus,* and in the rockier places scores of interesting and grotesque forms of the bitter-root (*Lewisia*).

Because some California annuals and bulbs from the valleys and foothills are difficult to grow in the East, many garden enthusiasts assume that all California wild flowers are unsuited to our climate around New York. This is as far from the truth as the other extreme. Many California species, both annual and perennial, are admirably suited to our gardens. To cite only a few, the California poppies, lupines, and species of *Leptosyne, Erythronium, Fritillaria,* and *Trillium* may be mentioned. Others do well if protected from too much moisture during their dormant season—*Calochortus, Brodiaea, Allium, Lewisia,* etc. Still others, because they are short-lived annuals, will give a good account of themselves on sunny, well-drained, gravelly slopes early in the season. These include species of *Gilia, Phacelia, Collinsia, Calandrinia, Limnanthes, Layia, Platystemon, Baeria,* and *Nemophila.*

Coöperating with the Botanical Garden in planning the display were representatives of the Advisory Council, Mrs. Carl A. de Gersdorff and Mrs. F. Leonard Kellogg. Special lights for giving a daylight effect to the planting were provided by Mrs. de Gersdorff, Mrs. Elon Huntington Hooker, and Mrs. William A. Lockwood.

Seeds and plants grown for this exhibit were furnished by Carl Purdy, Ukiah, Cal.; Theodore Payne, Los Angeles; Lester Rowntree, Carmel; and the Park Department of Los Angeles. Below is an alphabetical list of the subjects raised for the display.

Plants which bloomed just in time for the exhibit included:

Allium unifolium Kell., *Baeria gracilis* (DC.) A. Gray, *Brodiaea ixioides* Wats., *B. hyacinthina* (Lindl.) Baker, *B. laxa* Wats., *B. stellaris* Wats.

Calochortus amabilis Purdy, *C. amoenus* Greene, *C. monophyllus* (Lindl.) Jepson, *C. Maweanus* Leichtl., *C. uniflorus* Hook. & Arn., *Camassia Leichtlinii* (Baker) Wats., *C. Quamash* Greene, *Clarkia elegans* Douglas, *Collinsia bicolor* Benth., *C. bicolor* Benth. var. *alba, Delphinium variegatum* T. & G.

Dodecatheon Clevelandii Greene, *Erythronium californicum* Purdy, *Fritillaria lanceolata* Pursh., *F. pudica* Spreng., *Gilia capitata* var. *achilleaefolia, G capitata* Dougl., *G. dianthoides* Endl., *G. tricolor* Benth.

Layia elegans Torr. & Gray, *Leptosyne Stillmanii* A. Gray, *L. maritima* A. Gray, *Lewisia leana* Rob., *Limnanthes Douglasii* R. Br., *Lupinus nanus* Dougl., *L. succulentus* Dougl., *Mentzelia Lindleyi* T. & G., *Mertensia longiflora* Greene, *Monolopia major* DC., *Nemophila aurita* Lindl., *N. insignis* Dougl., *N. maculata* Benth., *N. atomaria* F. & M.

Oenothera ovata Nutt., *Phacelia campanularia* A. Gray, *P. Parryi* Torr., *P. tanacetifolia* Benth., *P. viscida* Torr., *P. Whitlavia* A. Gray, *Platystemon californicus* Benth., *Trillium sessile* var. *californicum* Wats., *T. sessile chloropetalum* Torr., *Verbesina encelioides* A. Gray, *Zygadenus Fremontii* Torr.

Mahonia Aquifolium Nutt., *Brodiaea volubilis* Baker, *Erythonium* "Pink Beauty," *Eschscholtzia californica* Cham.

Other plants, some of which were in bud or, in one case (*Sisyrinchium*), just past flowering, which were used for their foliage effect in the naturalistic planting, included:

Abronia umbellata Lam., *A. villosa* Wats., *Argemone platyceras* Link & Otto, *Baeria maritima* A. Gray, *Brodiaea capitata* Benth., *B. ixioides* Wats., *B. hyacinthina* (Lindl.) Baker, *B. laxa* Wats., *B. Purdyi* Eastw., *B. stellaris* Wats., *Calandrinia caulescens* HBK. var. *Menziesii, Clarkia pulchella* Pursh., *Collinsia grandiflora* Douglas.

Delphinium californicum T. & G., *D. uliginosum* Curran, *Diplacus longiflorus* Nutt., *D. puniceus* Nutt., *Epilobium obcordatum* A. Gray, *Fremontia californica* Torr., *Geraea canescens* T. & G., *Gilia californica* Benth., *G. densiflora* Benth., *G. liniflora* (Benth.), *Godetia amoena* Lilja.

Layia glandulosa Hook. & Arn., *Lewisia Cotyledon* Rob., *L. rediviva* Pursh, *Lupinus densiflorus* Benth., *L. formosus* Greene, *L. hirsutissimus* Benth., *L. Menziesii* Ag., *L. Stiversi* Kell., *Mimulus cardinalis* Dougl., *M. guttatus* (Fisch.), *Monardella lanceolata* A. Gray, *Oenothera bistorta* Nutt., *O. Hookeri* T. & G., *O. speciosa* Nutt., *O. trichocalyx* Nutt.

Penstemon sp., *Phacelia grandiflora* A. Gray, *Salvia Columbariae* Benth., *Sedum spathulifolium* Hook., *Sisyrinchium inflatum* (Suksd.) St. John, *Stylophorum diphyllum* Nutt., *Zauschneria californica* Presl.

Arctostaphylos Uva ursi Spreng., *Mahonia repens* G. Don, *Pinus contorta* Douglas, *Pseudotsuga taxifolia* Britton.

FORMAN T. MCLEAN,
CAROL H. WOODWARD.

NOTES ON THE GARDEN'S ADDITIONAL DISPLAYS

Besides the California wild flowers, for which both a bronze medal and a special prize were awarded, The New York Botanical Garden offered and coöperated in the presentation of a number of other outstanding displays at the International Flower Show, March 19–24.

Three species of *Drosera—D. capensis,* from Cape of Good Hope; *D. spathulata,* from Australasia; and *D. filiformis,* from the pine barrens of New Jersey, excited considerable interest because of their insect-eating proclivity. The Cape species was in full bloom, with recurved spikes of bright magenta flowers. A certificate of merit was given this exhibit.

Another certificate was presented for a group of fine specimens of *Scilla peruviana,* which were at the height of their bloom the week of the show.

Other plants raised in the conservatory and used to decorate the table at the side of the exhibit of California flowers included specimens of the Australian bottle-brush, *Callistemon citrinus*; one of the South African daisies, *Ursinia speciosa*; a South African bulbous plant, *Babiana stricta rubro-cyanea*; and the tall, handsome Mediterranean relative of our native mullein, *Celsia cretica.*

More than 100 begonias raised at The New York Botanical Garden were used by the Garden Club of America in a special exhibit, in which the plants—57 named varieties—were arranged as in a large sun-room. In connection with this exhibit, there was a demonstration of propagation of begonias from seed, leaf-cuttings, and tubers; also examples of plants infested with begonia mite.

Third prize was awarded to this exhibit, as a "demonstration display," and it was also selected as the fourth most interesting exhibit at the show.

The bronze medal of the Horticultural Society of New York was awarded to the Federated Garden Clubs of New York State for an example of rock-garden planting arranged by The New York Botanical Garden. This exhibit made clear the correct placing of rocks, preparation of soil, and provision for drainage, gave examples of suitable plants to use, and showed photographs of the new Thompson Memorial Rock Garden in construction.

The Garden also coöperated with the Federated Garden Clubs of New York State in showing, by the aid of photographs and living material, correct methods of propagation of a number of kinds of plants.

Further details about some of these exhibits, it is planned, will appear in later numbers of the JOURNAL.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

We much regret to record the death, on March 3, of Elizabeth Gertrude Britton (Mrs. N. L. Britton), for many years Honorary Curator of Mosses at The New York Botanical Garden. It is expected that an account of the life and career of Mrs. Britton will appear in a later number of this JOURNAL.

The aquarium exhibit in Museum Building of the Botanical Garden, an announcement of which appeared in the JOURNAL for January, has been continued to April 30.

Dr. E. D. Merrill, Director, spent the latter part of February in Florida as the guest of Colonel Robert H. Montgomery at Coconut Grove. The object of the trip was to advise Colonel Montgomery, in association with Dr. David Fairchild, on the development of the Coconut Grove Arboretum, established and maintained by Col. Montgomery. One of the objectives is to establish and maintain as many species of palms and cycads as possible. In less than two years about 280 species, including recently germinated seeds, have been secured. Following his stay at Coconut Grove, Dr. Merrill spent two days at Sebring, inspecting the Highland Hammock, which has been preserved by the late Mrs. Roebling, and in discussing matters pertaining to the possible establishment of a botanical garden on land adjacent to the Highland Hammock reserve.

About thirty books of historical interest were lent by The New York Botanical Garden to the Garden Club of America for an exhibit of sixteenth century works on herbs and other plants, which took place at 598 Madison Avenue, New York, from February 15 to March 24.

A course in spring gardening is being offered during April and May at The New York Botanical Garden. Practical instruction is given in growing annuals and perennials from seed, the members of the class starting plants for their own gardens, and lectures on such useful gardening topics as soil fertility and cultivation of plants are included.

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GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a beautiful rose garden, a rock garden of rock-loving plants, and fern and herbaceous gardens.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of narcissi, daffodils, tulips, lilacs, irises, peonies, roses, lilies, water-lilies, gladioli, dahlias, and chrysanthemums; in the winter displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 43,400 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10

Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be sent to

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JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

ELIZABETH GERTRUDE BRITTON
MARSHALL A. HOWE

MEMORIAL AND RESOLUTION OF THE ADVISORY COUNCIL

REPORT OF THE SOUTHERN APPALACHIAN EXPEDITION—I
EDWARD J. ALEXANDER

PROFESSIONAL GARDENERS COMPLETE SCIENCE COURSE
FORMAN T. MCLEAN

NOTES, NEWS, AND COMMENT

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ELIZABETH GERTRUDE BRITTON

Following soon after the deaths of Doctors Rydberg and Hollick, the scientific staff of The New York Botanical Garden has suffered another severe loss in the passing of Elizabeth Gertrude Britton on February 25. Born in the City of New York, January 9, 1858, she was one of the five daughters of James and Sophie Anne (Compton) Knight. Her Grandfather Knight, of Scotch and Welsh ancestry, conducted a furniture factory and a sugar estate in the vicinity of Matanzas, Cuba, and a considerable part of her childhood was spent on "The Pearl of the Antilles." In the company of her sisters and her father, who felt a keen interest in the flora, fauna, and geology of the island, she took many delightful walks and easily developed a love for living things. Incidentally, in those early years, she acquired a facile command of the Spanish language, which later was to prove of much practical service to her and her future husband in their botanical explorations of Cuba and Porto Rico. As she grew older, she was left for most of the year with her Grandmother Compton in New York to attend the private school conducted by Dr. Benedict. Later she entered the Normal (now Hunter) College, from which she was graduated in 1875, at the early age of seventeen. In October of the same year she was appointed a critic teacher in the Model School of that institution and in 1879 her interest in plants had become so pronounced that we find a record on December 9 of her election to active membership in the Torrey Botanical Club. Miss Knight's first botanical publication was a brief note on "Albinism" in the *Bulletin of the Torrey Botanical Club* for March, 1883. In April, 1883, her title in the staff of the Normal College was changed to Tutor in Natural Science, and in September of that year we find the forerunner of

what was destined to be a long series of papers on the North American mosses, entitled "On the fruit of *Eustichium norvegicum*." Based on fertile material collected by her in Wisconsin, she supplied description and figures of the "fruit" of a moss originally described (supposedly from Norway, but probably from Iceland) in 1827 and meanwhile, for fifty-six years, known only in a sterile condition. On August 27, 1885, Miss Knight was married to Dr. Nathaniel Lord Britton, at that time an Assistant in Geology in Columbia College—a geologist who had already developed a major interest in plants. The partnership of the two young botanists was to develop and intensify the botanical interests of both.

Mrs. Britton had begun a special study of mosses five years before her marriage. Afterwards she rather naturally assumed unofficial charge of the moss collections, small at the time, of Columbia College, and set about to increase them by exchange, purchase, and personal field work. In 1889, there appeared the first of a series of eleven systematic papers under the title of "Contributions to American bryology." At about this time she wrote numerous reviews and criticisms of a wide range of works for the *Bulletin of the Torrey Botanical Club* and published an enumeration of the ferns collected in South America by Dr. H. H. Rusby. She also announced a proposed handbook on the mosses of northeastern America, which was never published. In 1892, her list of the mosses of West Virginia appeared. The next year, with the aid of generous friends, the moss herbarium of August Jaeger, of Switzerland, "occupying about 90 cubic feet" was acquired and presented to the herbarium of Columbia College. This contained numerous valuable exsiccati and was a very important addition to the bryological resources of New York and of America. In 1894 Mrs. Britton began a series of eight beautifully illustrated articles under the title "How to study the mosses" in *The Observer*. These included keys to the local species of selected genera and descriptions of the illustrated species. The periodical in which this series was published was of ephemeral existence and unfortunately the papers were never reprinted as separates. However, taken with the notable "Contributions to American bryology," they sufficed to place Mrs. Britton in command of the bryological field in America. Other *Observer* articles with alluring special titles followed, such as "The luminous moss" [*Schistostega*], "The humpbacked elves'

ELIZABETH GERTRUDE BRITTON

(Photograph taken at her desk at The New York Botanical Garden, June 22, 1902)

[*Buxbaumia* and *Webera*], "The brownies" [*Phascum* and *Pleuridium*], "The water nymphs" [*Fontinalis* and *Dichelyma*] and "The umbrella mosses" [*Splachnum* and *Tetraplodon*].

In *The Linnaean Fern Bulletin* for April, 1896, Mrs. Britton related the story of how in 1879, she had found the rare and local Curly Grass Fern (*Schizaea pusilla*) in Nova Scotia. One of the few specimens collected there by her went to Dr. Asa Gray, of Harvard University, who wrote her that he had seen in Paris the specimens of this rare little fern collected years before by De La Pylaie in Newfoundland, but that he and every one else had supposed that the cited locality was incorrect and that the specimens must have come from New Jersey, where it is of local occurrence in the sand-barren region. She sent a specimen to the Rev. Arthur C. Waghorne, a resident of Newfoundland, and in 1896, he reported its rediscovery on that island. Mrs. Britton's interest in ferns persisted throughout her life, although it was chiefly as a specialist on mosses that she was known to botanists. In 1897 she published a revision of the North American species of *Ophioglossum*, the Adder's-tongue ferns. Later, with Miss Alexandrina Taylor, who contributed numerous excellent drawings, she published life-histories of the Curly Grass Fern (*Schizaea*) and of the tropical *Vittaria lineata*.

In April, 1902, Mrs. Britton was one of the prime movers in organizing The Wild Flower Preservation Society of America, with the coöperation of Dr. Frederick V. Coville, of Washington, as President; Mr. Charles Louis Pollard, of Washington, as Secretary; other managers, besides herself, including Professors Charles E. Bessey, of Nebraska; L. H. Bailey, of Ithaca; Dr. William Trelease, of St. Louis; Dr. C. F. Millspaugh, of Chicago, and Miss Alice Eastwood, of San Francisco. In August of the preceding year, the Misses Olivia and Caroline Phelps Stokes, of New York, had presented to The New York Botanical Garden a fund of $3,000, with the condition that the interest thereon "should always be used for the investigation and preservation of native plants or for bringing the need of such preservation before the public." Also in August of that year (1901) the formation in Boston of a Society for the Protection of Native Plants was announced, with its officers from eastern Massachusetts. A European *Association pour la protection des plantes*, with headquarters in Geneva, was started as

early as 1883, and, in the United States, the Audubon Society, beginning in 1886, was already doing important work in checking the extermination of native American birds and other native animals. Attractive plants, like the Trailing Arbutus, were disappearing, especially from the vicinity of the cities of the Northeast, and the time seemed ripe for a nationwide campaign for the protection of the native flora. Mrs. Britton was soon Secretary of the new society for two years (1904 and 1905) and again, a few years later, became as Secretary and Treasurer the motivating force of the organization. By her published papers, lectures, and extensive correspondence, she did much to arouse and develop the public sentiment that has resulted in the passing of laws for the protection of the native flora in various states, in the establishment of branch societies for wild-flower preservation, and in the development of conservation activities in thousands of schools and garden clubs. Notable among her writings on this subject was a series of fourteen articles under the title of "Wild plants needing protection," attractively illustrated in color by Miss Mary E. Eaton, which appeared in this JOURNAL from 1912 to 1929. As Chairman of the Conservation Committee of the Federated Garden Clubs of New York State, she was especially active in urging a national boycott against the use of the American Holly for Christmas decorations and in advocating the cultivation of the holly from seed.

About 1918 she asked Mr. P. L. Ricker, of Washington, to handle much of the correspondence, especially from the South. His success in this field resulted in the organization of The Wild Flower Preservation Society, Inc., with headquarters in Washington and with Mr. Ricker as President, in the gradual transfer of conservation activities to the new society, and finally, in 1933, in the formal dissolution of the parent organization. The present writer is informed that the new society receives about 10,000 requests for literature in a year.

Mrs. Britton was one of the group of members of the Torrey Botanical Club who were active in promoting the idea of establishing a botanical garden in the City of New York. In fact, the first suggestion of such a garden, in succession to Dr. David Hosack's Elgin Botanic Garden of 1801–1814 (located on the present site of the Rockefeller Center) has been traced to a remark that she

made to Professor Britton during a visit to the Royal Botanic Gardens at Kew in the summer of 1888. This remark was, in effect, "Why could we not have something like this in New York?" At a meeting of the Torrey Botanical Club held on October 24 of that year, she described the important and imposing establishment at Kew. At the next meeting of the Club a committee was appointed to consider the subject. The act of the state legislature incorporating The New York Botanical Garden was signed by Governor Hill on April 28, 1891. On July 1, 1896, Professor Britton became its first Director-in-Chief—a position that he held for more than thirty-three years, during all of which time Mrs. Britton was his constant helper. Her volunteer services in the care of the moss collections from the first were recognized in 1912 by her official appointment as Honorary Curator of the Mosses, a post that she held until her decease. It had been largely through her personal interest that the extensive collection of mosses and hepatics brought together by Mr. William Mitten, of Hurstpierpoint, Sussex, England, was acquired for the Botanical Garden in 1906. In 1913, partly in collaboration with Mr. R. S. Williams and with Miss Julia T. Emerson, Mrs. Britton contributed the systematic treatment of several families of mosses to the North American Flora, and, in 1915, she published an account of the mosses of the Danish West Indies. Later, she contributed the treatment of the mosses for her husband's Flora of Bermuda and for Britton and Millspaugh's The Bahama Flora. During the years 1917–1919, she was President of the Sullivant Moss Society.

The high esteem in which Mrs. Britton was held in Porto Rico was shown by a radiogram of condolence to Dr. Britton from Governor Winship, by separate resolutions of appreciation and sympathy from the two branches of the Porto Rican legislature, and by letters from Chancellor Chardon, of the University of Porto Rico, and from other prominent residents of the island.

A list of Mrs. Britton's contributions to the literature of botany, including reviews and short notes, prepared by Dr. John Hendley Barnhart for publication elsewhere, indicates the existence of 346 titles. Many species of mosses and other plants have been named in her honor. Mrs. Britton was a woman of extraordinary physical and mental energy—the possessor of a remarkably quick and brilliant intellect. She has left an enduring record in the literature of

science, and her well-directed activities have had an outstanding influence in the conservation of the native flora of the United States.

MARSHALL A. HOWE.

MEMORIAL AND RESOLUTION*

The members of The Advisory Council of The New York Botanical Garden desire to place on record their deep appreciation of the attainments and service of

ELIZABETH KNIGHT BRITTON

member of the Woman's Auxiliary of The New York Botanical Garden now termed The Advisory Council.

Internationally known as a noted botanist before her marriage to Dr. Nathaniel Lord Britton, she was keenly interested with him for over thirty-three years in the development of The New York Botanical Garden from its inception in 1895. During his leadership and vision as founder and Director-in-Chief, it became the third-ranking botanical garden of the world.

Mrs. Britton was honorary Curator of Mosses in The New York Botanical Garden, and a specialist in ferns; a writer of many articles on these subjects for botanical bulletins; a collector of rare plants when she accompanied Dr. Britton on his scientific yearly trips to Cuba, Puerto Rico, Jamaica, the Bahamas, and European countries; for years editor of the *Bulletin of the Torrey Botanical Club;* life member of the Botanical Society of America; Chairman of the Conservation Committee of the Federated Garden Clubs of New York State; and Secretary-Treasurer of the Wild Flower Preservation Society of America.

In her enthusiastic campaign for this preservation work, she lectured untiringly at meetings of garden clubs and schools, at public meetings, and before women's organizations in many states; had placards posted in railroad stations and post offices; supervised the making of colored slides and post-cards of the wild flowers, holly, and valuable Christmas greens, and literally broadcast educational pamphlets throughout the nation in her advocacy of wildflower and holly preservation—often depriving herself to finance her work. The impress of her constructive campaign lives after her!

It was during the genial and efficient leadership of Dr. W. Gilman Thompson, who had been intimately associated with the Botanical Garden from its founding in 1895, and acted as President of the Board of Managers from 1913 to 1922, that the

*This Memorial is signed by several members of the former Women's Auxiliary who were well acquainted with Mrs. Britton, though no longer members of the present Advisory Council—Ed.

Women's Auxiliary was instituted. Its informal meetings were generally held in the beautiful greenhouse auditorium of the Garden, and then, accompanied and guided by Dr. Britton, Dr. Thompson, and members of the scientific staff, the members were shown the last rare additions to its herbarium and library, its most recent living accessions, and the latest constructive work of the Garden development. It was in the old Lorillard Mansion in the hemlock forest, where tea was served, that the members of the committee recall the gracious hospitality of Mrs. Britton.

In her rare friendships, not granted to many, no effort seemed too great to assist those who truly sought the knowledge she could so charmingly and accurately impart. To these friends she revealed a personality of quaint, vivacious charm, a depth of kindness and thoughtfulness, and an irresistible enthusiasm for natural beauty in all its phases.

ELIZABETH BILLINGS
LOUISE W. CARNEGIE
LOUISE W. DICKEY
EMILY E. HEPBURN
ANNA GILMAN HILL
MRS. DELANCEY KANE
ELIZABETH G. LOCKWOOD
EVELYN B. PERKINS
ETHEL ANSON S. PECKHAM
MRS. JAMES ROOSEVELT
MARTHA P. STRONG
JULIA ISHAM TAYLOR
MARTHA STRONG TURNER

The following Resolution was adopted by The Advisory Council at their meeting Wednesday, April 18, 1934:

Resolved, that the foregoing Memorial be spread upon the minutes of The Advisory Council;

A copy sent to Dr. Nathaniel Lord Britton, and published in the JOURNAL OF THE NEW YORK BOTANICAL GARDEN.

BLANCHE FERRY HOOKER,
Chairman.

HENRIETTA MCCORMICK WILLIAMS,
Secretary.

REPORT OF THE SOUTHERN APPALACHIAN EXPEDITION—I

For a number of years, it has been the constant regret of European garden-lovers that American plants were so little known in gardens, and so nearly impossible to obtain in Europe.

A member of the Royal Horticultural Society of Great Britain made the statement that plants and seeds from regions closed to white men, such as Nepal and Thibet, were more easily obtained than those of the eastern United States. Since this statement and similar ones from other sources contained so much of truth, it was considered appropriate that The New York Botanical Garden organize a syndicate to finance an expedition into the southern Appalachians for desirable horticultural subjects. The plan was carried out upon the basis that each contributing member receive a share of seeds and plants collected.

The writer and T. H. Everett, Horticulturist, were appointed as the members of the expedition, and at almost the last moment, Stanley D. Pearson, Student Gardener, was added.

The expedition left New York in the midst of the "tropical" storm of August 23 and drove to Harrisburg, Pennsylvania, where the night was spent. Leaving early the next morning, we went to Hancock, Maryland, where we crossed the Potomac River. A few miles south we stopped at a small shale-barren and collected plants of *Houstonia longifolia,* a relative of the bluet, with numerous, much branched leafy stems, growing 4–6 inches tall and bearing at the tip of every branch clusters of small lavender flowers. We also collected plants of *Antennaria neodioica,* a small-leaved species forming closely set rosettes of gray-green.

We then made for the shale-barren bluffs of the Cacapon River near Largent, West Virginia. Here we found quantities of seed of *Allium cernuum,* which differs from our other native alliums in having the head of pink flowers nodding. Here also were numbers of plants of *Oenothera argillicola* in full flower. This *Oenothera* is a handsome plant, usually growing a foot to eighteen inches tall and widely spreading; its flowers are bright yellow, from 2–3.5 inches across when fully expanded. We collected plants here of *Senecio antennariifolius,* far past flower; its grayish, evergreen leaves should make it an attractive cover plant for dry, sunny, rocky slopes.

We then went out to Burlington, West Virginia, west of which, on steep shale slopes, we collected seeds of the shale-barren variety of *Holcophacus distortus*, an *Astragalus* relative, whose prostrate branches form a spreading rosette 3–6 inches across and bear numerous spikes of purplish-blue flowers on 1–2 inch stalks. Plants of *Trifolium virginicum* were also obtained here; this uncloverlike clover has a solitary tap-root and a crown of leaves 3–4 inches in height and bears several cream-colored heads of bloom. It does not have runners or creeping roots, thus differing greatly from other clovers. These two plants should prove satisfactory for rock gardens.

Turning south again, on a wooded slope we collected seed of *Blephilia ciliata*, a mint related to *Monarda*, and of *Campanulastrum americanum*, a Lobelia-like plant with a leafy spike of saucer-shaped blue-flowers.

Arriving at Petersburg, we took a side trip down the south branch of the Potomac River about ten miles. Here, on quartzite cliffs back from the river, we found the northern form of *Paronychia argyrocoma*. This plant, about 4 or 5 inches high, forms sprawling tufts of silvery green with even more silvery sprays of flowers on the ends of the branches.

Along the roadside nearby, we collected cuttings from a tree of *Cercis canadensis* which was in full flower; this may prove to be a fall-blooming variety, and it is to be hoped it may be propagated.

Driving on to Monterey, Virginia, we gathered plants of *Aster oblongifolius* and seed of a very deep-colored form of *Allium cernuum*.

Going east from Monterey, we collected seed of *Porteranthus trifoliatus* and *Heuchera pubescens*. Further east, at the village of Headwater, we stopped at a shale-barren where grew *Oenothera argillicola*, *Eriogonum Alleni*, and *Sedum Nevii*. The *Eriogonum*, which grows about two feet tall, was at its height of bloom, its large flat cymes of deep yellow flowers making a splendid sight on the steep slopes; individual plants had 8–10 stalks of bloom, with a spread of three feet; the leaves are dock-like, densely woolly beneath with tan hairs.

Arriving at Staunton, we went up the Shenandoah valley to Lexington, then turned west to Clifton Forge. Leaving here the next morning, we found quantities of *Oenothera argillicola* with flowers

FIGURE 1. A shale-barren slope near Largent, W. Va. The steep slope in the foreground shows the habitat of *Oenothera argillicola*; that in the middle distance the habitat of *Senecio antennariifolius, Trifolium virginicum*, and *Allium cernuum*

over three inches across, the largest flowers we found of this species.

Going on to Lewisburg, West Virginia, we stopped along the way to collect seeds of *Draba ramosissima* and *Allium oxyphilum,* the latter a white-flowered species similar to *A. cernuum*. The *Draba* forms tufts of gray-green leaves, with numerous sprays of tiny white flowers, the whole seldom over six inches tall.

We then ran down to Pearisburg, Virginia, for the night, and next morning explored Peter's Mountain for *Sphaeralcea remota,* a very rare member of the Mallow Family, which we did not find, although we searched for several hours in a driving rainstorm, which drenched us to the skin. Changing to dry clothes, we proceeded to Mountain Lake, and on the road up the mountain to this resort, we collected seed of *Scutellaria saxicola, Heuchera villosa, Aruncus sylvester, Disporum lanuginosum* and *Hugeria erythrocarpa*. The Disporums are somewhat like the Uvularias, but more branching and hairy; their fruit is an oblong red berry. *Hugeria* is a relative of the blueberries, with flowers like those of a cranberry, but with huckleberry-like fruit, which is dark-red until dead ripe and then black. The fruit, though acid, is pleasant to the taste. The night was spent here, where we visited the summer biological laboratory of the University of Virginia, and next morning Dr. R. P. Carroll of this laboratory accompanied us to the summit of Bald Knob, altitude 4,380 feet. On the slopes of this mountain we collected seed of *Ilex monticola, Hydatica petiolaris*, and *Viburnum alnifolium*. This saxifrage relative (*Hydatica*) has a rosette of broadly toothed, wedge-shaped, long-stalked leaves and much-branched panicles of irregularly shaped white flowers, the two larger petals having yellow or brown spots.

We then proceeded to Blacksburg, and along the way collected seed of *Clintonia umbellulata* and *Pinus pungens*, and plants of a dwarf form of the composite, *Liatris spicata*. The *Clintonia* differs from the northern *C. borealis* in having a more terminal umbel of creamy-colored flowers and black berries.

A day was spent exploring around Radford, where we collected seed of *Prunus alleghaniensis, Berberis canadensis*, and *Rudbeckia triloba*, and plants of *Pachystima Canbyi*.

We then went southwest to the Unaka National Forest, where we ascended Whitetop Mountain, altitude 5,520 feet, collecting seed

of *Sibbaldiopsis tridentata*, the mountain cinquefoil. A new species of *Ilex*, with long-stalked berries, was also found here.

The night spent at Jefferson, North Carolina, the next day's run was to Asheville, stopping near Blowing Rock to collect seed of *Chrysopsis aspera*, a species with silvery, grass-like leaves, and of *Polygala viridescens*, an annual species with several heads of pink flowers.

FIGURE 2. Cliffs on the east face of Whiteside Mountain near Highlands, N. C. On the summit of these cliffs, quantities of *Leiophyllum Lyoni* and *Robinia Hartwigii* were found; the lower and wetter cliffs were draped with *Hypericum Buckleyi*.

Exploring the mountains east of Asheville the next day, we collected seed of *Viorna Viorna*; *Cynoglossum virginianum*, a large-leaved species with long-branching sprays of bright blue flowers; *Parthenium integrifolium*, and a small quantity of *Phlox amplifolia*.

We then visited the Nik Nar Nursuries, whose owner, Mr. G. Latta Clement, gave us collected wild seed of *Dodecatheon Hugeri*, a pale-flowered species; *Aconitum reclinatum*, and *Calycanthus fertilis*.

Then going to Elizabethton, Tennessee, we lost three days attempting to get up Roan Mountain, being held back by heavy rains. We did, however, get seed of *Campanulastrum americanum* and of *Houstonia tenuifolia*, another relative of the bluet, with very slender leaves and branches and small lavender flowers.

Returning to Asheville, we then turned southwest to Sylva, collecting *en route* seeds of two species of *Polycodium, Coreopsis pubescens,* and *Thalictrum revolutum.* The Polycodiums or squaw-huckleberries should be more grown as shrubbery, as their quantities of white flowers with long protruding brownish stamens are very handsome. One of the two species here collected has large dull red berries, the other small green ones; both are insipid to the taste.

Then turning down to Franklin, we stopped to climb Cowee Bald, altitude 5,085 feet, and near the summit obtained seed of *Diphylleia cymosa* and *Pyrularia pubera. Diphylleia* is a relative of the May-apple, *Podophyllum peltatum.* It has two leaves, often 8 10 inches across, at the summit of the stem, above which rises an umbel of white flowers, followed by blue berries borne on red stalks; the entire plant is usually 2–3 feet tall.

From Franklin we ascended Wayah Bald, altitude 5,500 feet, and near the summit obtained a large quantity of seed of *Hypericum Buckleyi,* a shrubby species, rarely reaching over six inches in height, with numerous yellow flowers. This should prove suitable for rock gardens.

Then proceeding south to Highlands, we stopped to examine some plants of *Parnassia asarifolia* in the spray of a water-fall, and here found seed of *Thalictrum clavatum,* a dwarf species averaging 6–8 inches, and frequenting wet rocks and stream beds.

At Highlands we made the acquaintance of Mr. T. G. Harbison, who took us to a fine colony of *Stuartia pentagyna grandiflora,* of which we collected seed. This handsome member of the Tea Family forms a small bushy tree with white flowers fully three inches across, with purple stamens. The typical form has brilliant yellow stamens. We collected along the way also seed of *Ilex Beadlei* and *Polygala Curtissii.* The *Ilex* is a dwarf, rarely growing over six feet tall, with velvety leaves, and densely covered with large red berries. The *Polygala* is an annual species with much-branched stems bearing heads of bright pink flowers. On Satulah Mountain,

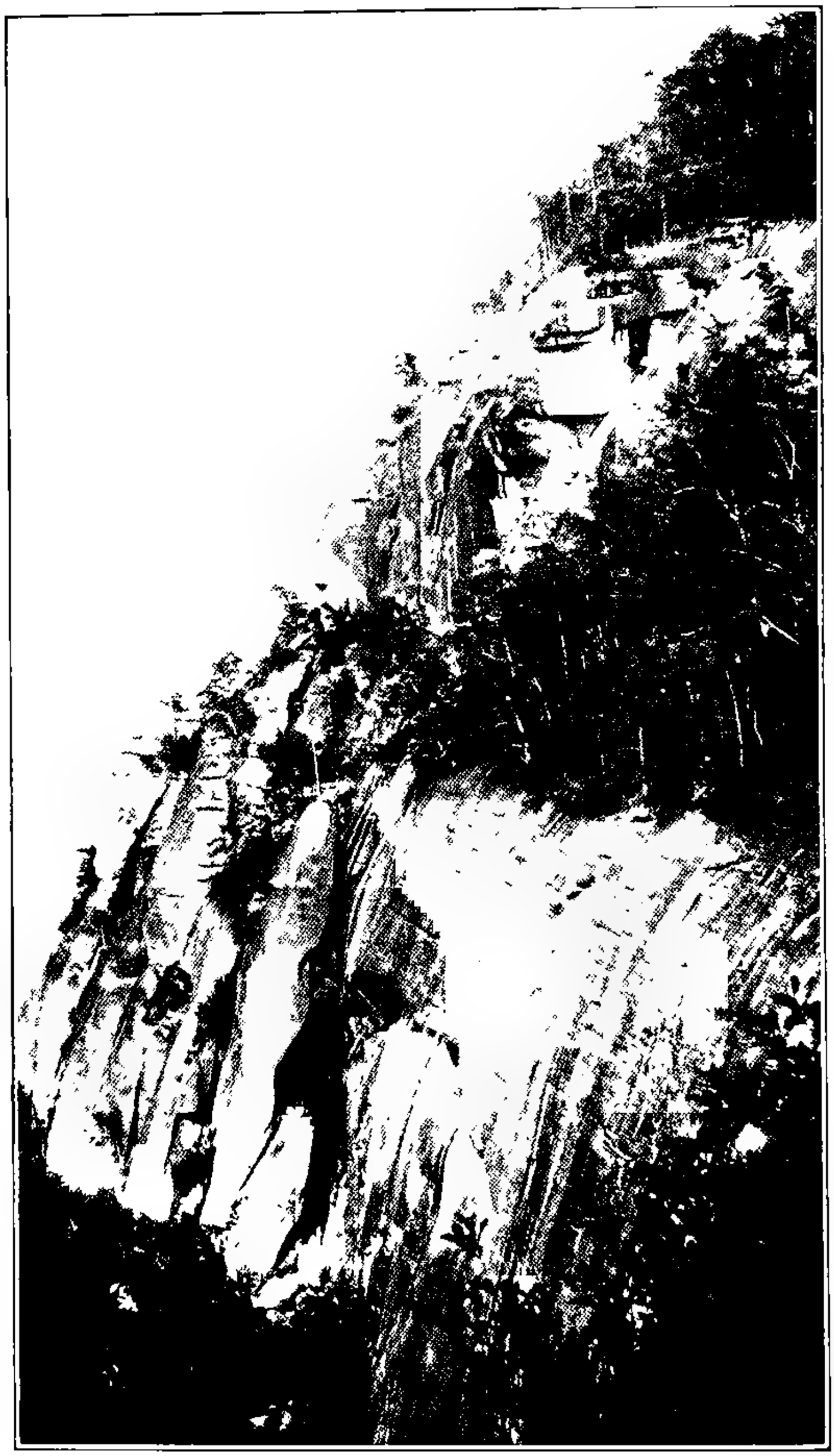
within the town limits, we collected seed of *Trautvetteria carolinensis* and *Phlox maculata*. *Trautvetteria* is a relative of the Cimicifugas, growing 1–2 feet tall with flat topped sprays of feathery white flowers, and large, palmately cut leaves. It grows in the rocky beds of streams or on dripping rock ledges.

Mr. Harbison went with us to Whiteside Mountain, a massive granite dome, altitude 4,830 feet, on the summit of which we obtained seed of *Leiophyllum Lyoni*, *Robinia Hartwigii*, and *Hyperi-*

FIGURE 3. Indian Gap in the Great Smoky Mountains. A typical valley of the southern Appalachians, showing the heavily forested slopes. The mountains on either side rise to an elevation of over 6,500 feet.

cum Buckleyi. *Robinia Hartwigii* is a rare species, forming a small bushy tree 6–12 feet tall, with spreading spikes of purplish-rose flowers.

Then we went down into Horse Cove, a deep valley east of Highlands, to collect seed of *Lysimachia Frasери*, a plant of great promise. This rare *Lysimachia* grows 2–3 feet tall, with terminal panicles 6–8 inches high, and of the same breadth, bearing yellow flowers. It should make a fine border plant. We obtained also seed of *Lobelia amoena*, a species with tall spikes of blue flowers,



Sarracenia purpurea, Polygala cruciata, Rhexia virginica, Rudbeckia monticola, and *Helianthus atrorubens,* the last-named a sunflower with most of the leaves basal, and black-centered heads. Plants were obtained of *Aster surculosus,* a species growing about one foot tall with large terminal sprays of heads of lavender flowers.

Upon our return to Asheville, Mr. Clement accompanied us to Flat Rock, near which, in a swamp noted for its peculiar flora, we obtained seed of *Coreopsis helianthoides, Kalmia carolina,* and a species of *Eryngium.* This *Kalmia* is somewhat similar to *Kalmia angustifolia,* the sheep-laurel or lambkill, but it has bluish leaves and larger, rose-colored flowers. Near here, he also showed us a colony of an *Aster* he could not identify, which proved to be *Aster spectabilis,* a coastal species.

Again accompanied by Mr. Clement, we ascended Mt. Mitchell, altitude 6,711 feet, and along the way collected seed of *Thermopsis fraxinifolia, Robinia viscosa, Hypericum graveolens, Solidago glomerata,* and *Parnassia asarifolia,* and plants of *Houstonia serpyllifolia. Thermopsis fraxinifolia* is quite different from other species of this genus in cultivation, having all the branches, which are widely spreading, terminating in spikes of yellow flowers. *Hypericum graveolens* is a perennial herbaceous species growing about a foot tall and having coppery-yellow flowers about one inch across. *Parnassia asarifolia* is a handsome species with white flowers an inch and a half across strikingly veined with yellowish green lines.

EDWARD J. ALEXANDER.

(To be continued)

FIGURE 4. A close-up of the face of Chimney Rock Mountain, showing the narrow path along the cliffs. The trees are mostly *Pinus pungens* and *Tsuga caroliniana.* Along the cliff path, marked by the trees, *Trautvetteria carolinensis* and *Heuchera parviflora* were found, while on the cliffs above were *Talinum teretifolium, Lonicera flava, Opulaster australis,* and a number of other less rare plants.

PROFESSIONAL GARDENERS COMPLETE SCIENCE COURSE

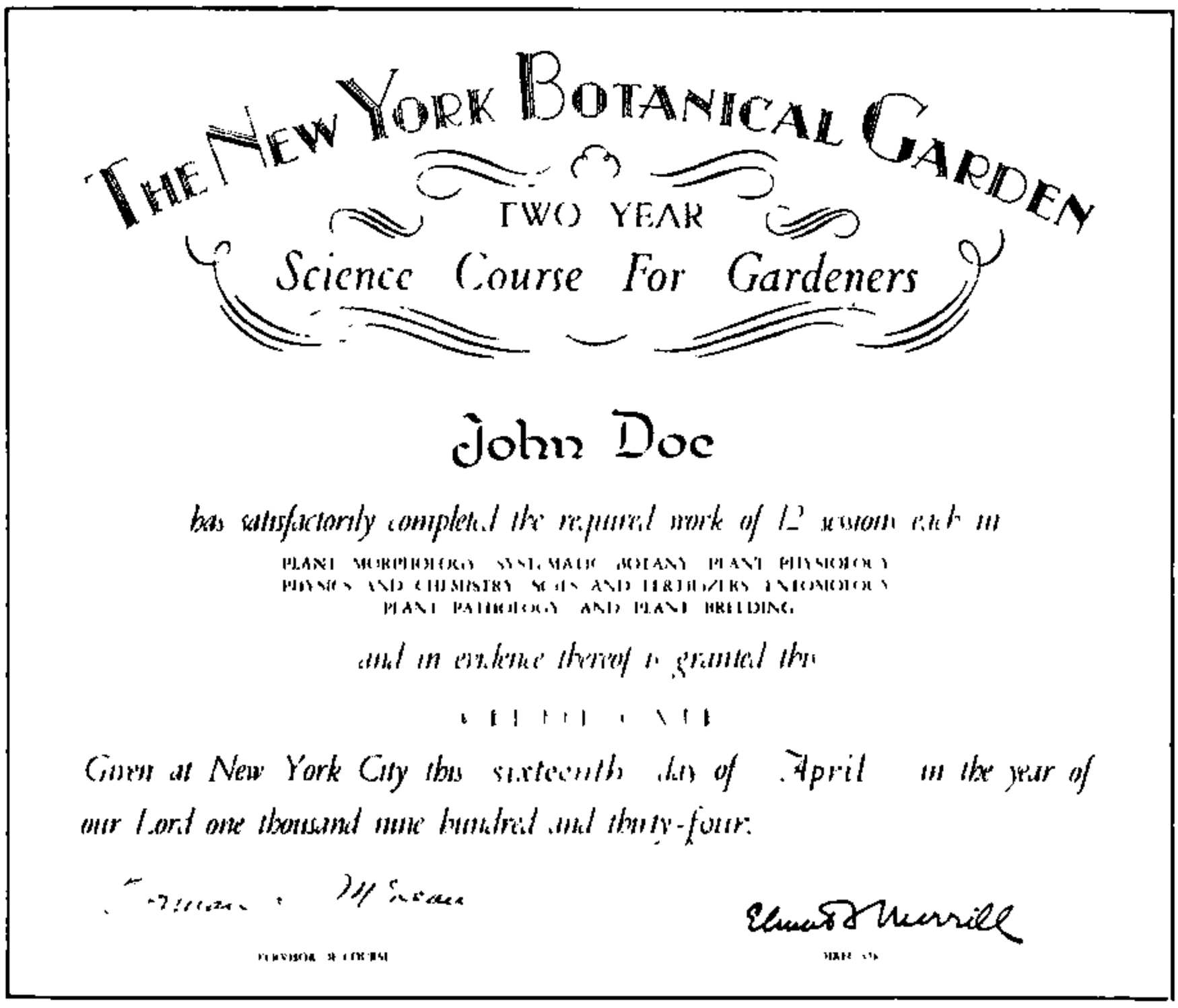
The course of study in the sciences underlying the gardening profession, which was initiated two years ago by The New York Botanical Garden, was completed by the first class of students and professional gardeners on Monday evening, April 9, with appropriate closing exercises in the rooms of the Horticultural Society of New York on that evening.

The course comprised eight subjects as follows: Systematic Bot any by Dr. H. A. Gleason, Plant Physiology by Forman T. McLean, Physics and Chemistry by Dr. E. N. Grisewood, Plant Morphology by Dr. Forman T. McLean, Entomology by Dr. E. P. Felt, Soils and Fertilizers by Dr. Forman T. McLean, Plant Breeding by Dr. A. B. Stout, Plant Pathology by Dr. B. O. Dodge.

The lectures were given in the evenings at the Horticultural Society and the instructors have given their personal time outside of business hours to conducting it. Mr. T. H. Everett, our Horticulturist, has acted as mentor for the professional gardeners, attending all of the meetings, and because of his previous experience with similar instruction at the Royal Botanic Gardens in Kew, England, has rendered invaluable assistance in making this course effective.

The project was undertaken primarily to provide instruction for the young student gardeners in training at The New York Botanical Garden and was extended to include experienced professional gardeners from private estates, as it was felt that the contact thus given between the older gardeners and the students would be mutually beneficial. It has proved eminently so. The enrolment for the first year of the course was seventy-two and for the second year was sixty-four. This included a large number of the leaders in the gardening profession in the vicinity of New York City, many of whom undertook the studies without any desire for credit or further recognition as a result of it. Accordingly, many took only a portion of the course and many others who found the work interesting and continued it through the entire two years still did not feel any desire to receive credit for it. Accordingly, among those who did complete the course for credit were most of our own young student gardeners for whom it is a necessary part of their training.

An interesting feature of the final awarding of the certificates to those who completed the entire course is that it includes in the roster an equal number of the mature professional gardeners and of our own young men, and many of these older professional gardeners completed the required reports entirely because of their interest and desire to get the most possible out of the work, as they obviously had nothing to gain by adding another certificate to their already long list of attainments.


THE NEW YORK BOTANICAL GARDEN

TWO YEAR

Science Course For Gardeners

John Doe

has satisfactorily completed the required work of 12 sessions each in

PLANT MORPHOLOGY SYSTEMATIC BOTANY PLANT PHYSIOLOGY
PHYSICS AND CHEMISTRY SOILS AND FERTILIZERS ENTOMOLOGY
PLANT PATHOLOGY AND PLANT BREEDING

and in evidence thereof is granted this

CERTIFICATE

Given at New York City this sixteenth day of April in the year of our Lord one thousand nine hundred and thirty-four.

Elmer D. Merrill

DIRECTOR

FIGURE 1. Facsimile of certificates awarded April 16 to twelve men on completion of a two-year science course for gardeners.

At the meeting on Monday evening Director Merrill presided and told about the general character of the work as outlined above. He then called upon Mr. Henry de Forest Baldwin, Vice-President of the Board of Managers of The New York Botanical Garden, who struck an optimistic note in emphasizing the need for American-trained professional gardeners and the increasing opportunities for men in this profession. The pleasant task of the gardener, Mr.

Baldwin remarked, is to create beauty, and where a trained horticulturist has created a place of beauty, this stirs a desire in others around him to emulate that beauty, and so one good gardener by his works creates a demand for more garden beauty and more gardeners. On the personal side, Mr. Baldwin stated that love of garden beauty develops fine traits of character and that the gardener is fortunate in that he is paid to do the things that he most enjoys doing. By creating beauty he contributes to our civilization. Mr. James Stuart, Superintendent at the Constable Estate, Mamaroneck, New York, representing the Horticultural Society of New York, congratulated the students on their achievements in their studies, which will make them better gardeners and give them the facility to discuss plant life and plant problems intelligently with each other and with their employers. On behalf of the Horticultural Society, he stated that it was glad to accommodate activities of this kind.

Director Merrill then introduced Mr. Fred Sparks, who voiced his high appreciation of the work being done, and stated that this would constitute a nucleus from which broader knowledge and understanding of science would spread in a wide circle until its influence would be felt in all the gardening world. Mr. Aymar Embury, 2nd, representing the Department of Parks of the City of New York, emphasized the need for more and better-trained horticulturists in the park work of the cities and welcomed the close coöperation now existing between the botanical gardens and the park system. Mr. Donald Crighton, Superintendent of the Paul Moore Estate, Convent, New Jersey, speaking on behalf of the students completing the science course, was particularly commendatory of the democratic spirit shown by both the professional gardeners and their instructors and the close understanding which developed between the men drawn from such different fields of activity. He also expressed the wish that the work might be enlarged to include more advanced studies, stating that many of those who have completed this two-year course would like to go more deeply into the botanical sciences.

Dr. Merrill then paid tribute to the Horticultural Society and to Miss Hall, the Librarian, who was most closely identified with the administration of the science course, and presented her a bou-

FIGURE 2. Students in the Science Course for Professional Gardeners, who received certificates for completion of the first two-year course given by The New York Botanical Garden are shown above. In the first row, left to right, are: Edwin Beckett, Sven Woodland, James Esson, P. J. McKenna, Kenneth Hadland, and Donald Crighton. Standing at the left is Walter Wolney, while seated across the center are John Borin, James Cahill, Albert Gebert, and Thorleif Anderson. Stanley Bulpitt, the other student receiving a certificate, served as the photographer for the group. Seated in the center is Miss Elizabeth Hall, Librarian for the Horticultural Society of New York, holding the bouquet presented to her in recognition of her assistance. Instructors and the Director, standing at the rear, are, left to right: Dr. E. P. Felt, T. H. Everett, Dr. H. A. Gleason, Dr. E. D. Merrill, Dr. Forman T. McLean, and Dr. B. O. Dodge. Dr. A. B. Stout and Dr. E. N. Grisewood also taught during the course.

quet as a testimonial to her excellent coöperation in this undertaking.

He then gave the certificates testifying to their completion of the course to the following men: Mr. Thorleif Andersen, The New York Botanical Garden; Mr. Edwin Beckett, Superintendent Ogden Reid Estate, Purchase, New York; Mr. John G. Borin, The New York Botanical Garden; Mr. Stanley F. Bulpitt, Brookside Nurseries, Darien, Connecticut; Mr. James Cahill, The New York Botanical Garden; Mr. Donald J. Crighton, Superintendent Paul Moore Estate, Convent, New Jersey; Mr. James G. Esson, Superintendent Mrs. Roswell Eldridge Estate, Great Neck, Long Island; Mr. Albert Gebert, The New York Botanical Garden; Mr. Kenneth M. Hadland, A. Ludlow Cramer Estate, Westbury, Long Island; Mr. Patrick J. McKenna, The New York Botanical Garden; Mr. Walter W. Wolney, The New York Botanical Garden; Mr. Sven Woodland, Albany, New York.

Mrs. Elizabeth Peterson, executive secretary, assisted by the staff of the Horticultural Society and by Mrs. Samuel Seabury and Mrs. Robert Herndon Fife, then served coffee and sandwiches to the visitors and participants, numbering about fifty.

FORMAN T. MCLEAN,
Supervisor of Public Education.

NOTES, NEWS, AND COMMENT

Dr. A. B. Stout spoke on "Daylilies: Old and New," on April 14th, in the series of winter lectures at the Morris Arboretum of the University of Pennsylvania.

An interesting collection of about 250 numbers of dried plants was recently received for determination from the Yale North India Expedition of 1932. The specimens were collected by Dr. H. de Terra and Dr. G. E. Hutchinson in connection with their geological work in eastern Ladak (Little Tibet); nearly 100 of these numbers are represented by specimens retained for the herbarium of the Botanical Garden, the others having been returned to Yale University after identification. The determinations were made by Dr. E. D. Merrill and Mr. G. L. Wittrock. Most of the species represented are matched in the extensive collection of Dr. Koelz,

received from the Himalayan Research Institute of the Roerich Museum and the large collection presented by Dr. R. R. Stewart.

A final report has just been made on the 670 numbers of dried plants of the sixth Hainan Expedition of Lingnan University, Canton, a collection of more than unusual interest. This material was collected by S. K. Lau, his expedition being in part financed through funds supplied by President Henry W. de Forest. A collection of 360 numbers made by W. T. Tsang in northern Kwangtung for Lingnan University has just been received for study.

At the meeting of the National Academy of Sciences held in Washington, D. C., April 23–25, Dr. B. O. Dodge presented a paper on "A lethal for ascus abortion in Neurospora." His studies were based on cultures originating in part from an ascospore that had been treated with x-rays. The lethal condition induced by this treatment often operates to kill the spores after they have germinated. It also prevents delimitation of ascospores in a certain percentage of cases. The ascus affected attains its full size, but it degenerates, turns brown, becomes indurated and striated like a monstrous ascospore.

A remarkably complete and interesting collection of herbarium specimens, with several sets of duplicates, was received a short time ago from Sun Yatsen University, Canton, China. The material was collected by the second and third Hainan Expeditions of that institution by Messrs. F. C. How, N. K. Chun, and C. L. Tso. There are in excess of 2,400 numbers in the combined collections, making these among the most extensive and comprehensive collections of botanical material ever made in Hainan. The material will be studied by Director Merrill in coöperation with Prof. W. Y. Chun, of Sun Yatsen University. The field work was in part financed by funds generously supplied by President Henry W. de Forest.

The Garden has recently received from the American Museum of Natural History a magnificent collection of botanical material from British New Guinea (Papua) for identification. This collection, probably the most extensive and valuable one ever made

in that particular region, contains in excess of 2,000 numbers, with ample duplicates. Much of it is from medium and higher altitudes, up to somewhat over 12,000 feet. The material was prepared by Mr. L. J. Brass, botanist to the Richard Archbold Expedition of the American Museum of Natural History in 1933. The specimens are remarkably well prepared, and are supplied with ample field notes. Identifications will be made by Director Merrill with the coöperation of various specialists.

Dr. James P. Chapin, of the American Museum of Natural History, has recently transmitted to The New York Botanical Garden the extensive botanical collections made by him on Mount Ruwenzori, Mount Kenya, and Kivu Volcano, in central Africa, and in the Lukolela region of Belgian Congo in 1926–27 and 1930–31.

The following visiting botanists have registered in the library during the winter: Mr. D. S. Carpenter, Middletown Springs, Vt.; Mrs. Lincoln W. Riddle and Prof. M. L. Fernald, Cambridge, Mass.; Dr. I. M. Johnston, Jamaica Plain, Mass.; Prof. L. H. Bailey, Prof. H. M. Fitzpatrick and Prof. H. H. Whetzel, Ithaca, N. Y.; Dr. Edgar T. Wherry, Philadelphia, Pa.; Prof. L. O. Overholts, State College, Pa.; Dr. Walter T. Swingle, Messrs. Egbert H. Walker, Thomas H. Kearney, and William A. Dayton, Washington, D. C.; Dr. M. L. Lohman, Asheville, N. C.; Dr. George Hume Smith, Indianapolis, Ind.; and Dr. Robert E. Woodson, Jr., St. Louis, Mo.

"The chestnut crop this fall in Pennsylvania is better than it has been for years, reports John B. Aughanbaugh, attached to the Pennsylvania Forest Research Institute, Mont Alto. The burs are large and are filled with plump chestnuts, probably the result of the favorable growing season of the past summer. There are today growing in the Pennsylvania State Forests chestnut seedlings, the nuts of which have come from Connecticut, New Jersey, Michigan, Ohio, and other states as well as from Asia and Europe. From 90 to 95 per cent of the nuts which Aughanbaugh has planted have germinated successfully. The purpose of these plantings is to determine whether the trees that result show increased resistance to the chestnut blight when attacked by this bark disease."—[*Forestry News Digest,* December, 1932.]

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Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

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The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

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THE NEW YORK BOTANICAL GARDEN
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HARDINESS IN PLANTS[1]

As long as I have been engaged in horticulture, I have been interested in the problems pertaining to hardiness in plants. Anxious from the first to familiarize myself with the peculiarities of the plant material with which I was working, I began taking local notes on the manner in which various plants survived the winter.

That seemed simple enough. But the second year, when I set out to verify and complete my notes, I found that plants which I had marked down as hardy during the previous severe winter appeared to be tender, though the season had been much milder. I concluded that my observations had been at fault, and continued taking notes, extending my observations from the Imperial Parks at Potsdam to the Botanical Garden at Dahlem-Berlin. But after three or four winters my notes had become so complicated and contradictory that I commenced to suspect that temperature was not alone the deciding factor in the hardiness of plants. My view was confirmed by many experienced gardeners whom I consulted. It became apparent that the condition in which a plant entered the winter—which in turn depended upon the preceding growing season, as well as on local conditions—was of at least as much, if not of greater, importance.

In the twenty years since then, the subject has never ceased to absorb my attention. Out of the innumerable strange instances of hardiness which I observed (some of which I shall cite later on), I have learned, in particular, two things:

[1] A lecture given before the Conference of the Scientific Staff and Registered Students of The New York Botanical Garden, on April 12, 1934.

First: That it is possible to grow a great many more plants out of doors than is generally believed, provided that we do not give up in despair after the first failure but rather follow the plant closely through its life cycle for several years and adjust gradually the conditions under which it grows until they are most favorable to bring about hardiness. The first trial has to be based on a guess, and it is a method of hit or miss, but this is still the best we can do. After a few successes we will find that it will become easier and ever easier to guess right from the start.

Second: I have learned that it is frequently quite impossible to say of a plant outright, "It *is* hardy." I have learned to say instead, "It can be grown successfully outdoors in this vicinity," which implies that it is hardy provided that conditions and treatment are right.

In outlining what constitutes and what influences hardiness I shall commence with the results of the investigations of the physiologists, then quote the observations of the practical horticulturist and gardener, and conclude with a preliminary report on the injuries which have resulted from this past severe winter.

The physiologists, in general, agree that winter hardiness is a very indefinite and complex matter, depending on numerous widely different factors which often exclude one another, and that it is not necessarily identical with frost resistance. The resistance to severe dehydration, the ability to remain dormant through prolonged warm spells in the winter, and the capacity to stop and start growth at the most opportune times in autumn and spring, which means to be in tune with the changing seasons, are at least as important as the ability to withstand low temperatures.

What actually is the life-sustaining factor at very low temperatures and what is the quality that renders one plant more resistant than another are still very much of a mystery, even to physiologists. The theory advanced by the Russian investigator, Govorov, that hardy plants fall into a state of anabiosis, during which respiration is almost suspended, certainly is interesting. He contends that in this state of anabiosis the hardy plant does not suffer from the deficiency of oxygen in the soil which, according to his opinion, is the main cause of death for non-hardy plants in the winter. Similar conditions of suspended life occur also in animals and even in human beings, as we all know, but in what this condition actually

consists, and what brings it about, we cannot expect to be able to explain until we have solved the eternal mysteries of life and death. What we do know, thanks to the research work of the plant physiologists of the world, is what goes on in the plant cell when it freezes and when it dies from freezing; to a certain extent, also, what goes on in a cell which freezes but survives.

From these researches it appears that when plant tissue is subjected to a sufficiently low temperature, ice is formed, in particular in the intercellular spaces toward which, with further lowering of the temperature, more and more water is drawn, first from the cell sap and finally also from the plasma. The physiologists are divided as to what causes the death of the plasma, if the temperature sinks too low. Some of them insist that death results from the chemical influence of the increased concentration of salts and acids on the colloids of the plasma, while others maintain that the plasma is injured mechanically by the compression of the cells caused by the ice crystals which accumulate in the intercellular spaces. I am not a judge, since I am not a plant physiologist and have never investigated these conditions, but it seems to me quite possible that both parties are right, and that either type of injury, perhaps even both simultaneously, may result, depending upon the kind of plant and the condition of the plant which is used for the experiment. In either case it seems to be important for the plant cell, in order to increase its hardiness, to decrease its content of free water which may be frozen, and this is, quite apparently, what actually happens.

A method to use the condensation of the cell sap or the decreased free water content of the hardened cell, respectively, in order to measure the degree of hardiness of a plant, was first suggested by Newton, who experimented with different varieties of winter wheat. Pressing out the sap of uninjured leaves under pressure of 400 atmospheres, he found that hardened leaves gave up only an insignificant amount of sap, while tender leaves gave up their sap easily.

In the protoplasm the water is bound by hydrophilic colloids which are formed during the process of hardening and which, to a certain extent, seem to prevent fatal dehydration. In the cell sap, water may be bound, for instance, by an increased sugar content. A concentrated sugar solution gives water off only slowly,

and the slower, the more concentrated it becomes. It seems, however, that the importance of the protective rôle of the sugars has been considerably overstressed. In the dormant, or, as the gardener says, ripened twigs of trees in the fall, there is noticeable a very marked condensation of the cell sap and a decrease in free water content, but there is no sugar. The cells of these dormant twigs are filled with starch. Sugar is not formed in these cells until after they have been subjected to low temperatures, and the sugar content gradually increases during the winter.

In this connection I wish to mention the extremely interesting observations of Coville, who experimented at first with blueberries, but later also with many other plants, and who suggests quite a different rôle for the sugars in the cells of wintering plants (as reported in the *Journal of Agricultural Research,* Oct., 1920). For purposes of cross-fertilization Coville brought some blueberry plants into a greenhouse with favorable growing temperature at the end of the summer. These plants refused to continue their growth, however. They gradually dropped their leaves and went into a state of complete dormancy, remaining in this condition in spite of a greenhouse temperature which in spring and summer would have kept the plants in luxuriant growth. When finally towards the end of winter other plants were brought in from the field, these latter at once burst into leaf and flower, while the indoor plants remained dormant as before. At first it was supposed that the plants needed to be frozen to start them into growth, but a single freezing proved ineffective. Then it was found that the dormant plants would start into growth without any freezing whatever. It was necessary only that they be subjected to a period of prolonged chilling, usually two or three months, at a temperature a few degrees above freezing. Plants kept continuously warm, without chilling, in some instances remained dormant for a whole year.

In the course of his observations Coville reached the conclusion that the transformation of the stored starch into sugar which occurred in the dormant twigs during the period of chilling was the vital factor, and suggested that the development of high osmotic pressure caused by the concentrated sugar solutions in the cells might be the mechanism which started the plants into growth. In explanation of the formation of sugar during the process of

chilling, he advanced the theory that the starch grains stored in the cells of the plant are at first separated by the living cell membranes from the enzyme that would transform the starch into sugar, but when the plant is chilled the vital activity of the cell membrane is weakened, so that the enzyme leaks through it, comes in contact with the starch, and turns it into sugar.

In view of these interesting suggestions it would be of vital importance for truly hardy plants to be able to remain dormant during prolonged spells of warm weather in February, after several months of chilling, and in spite of the rich sugar content of their cells. An explanation for this ability of many plants has not been advanced so far.

The most interesting paper on the problem of hardiness in plants which I have come across, and to which Dr. Stout directed my attention, is one by the Russian, N. A. Maximow, entitled, "Internal Factors of Frost and Drought Resistance in Plants," published in 1929 in the Journal "Protoplasma." Maximow seems to have been the first to recognize the analogy between frost and drought resistance, and he gives an excellent review of the present state of both questions.

From his own investigations, as well as by an extensive literature which he cites, he points out that in both cases the resistance lies in the capacity of the protoplasm to withstand the dehydrating influence of a direct or indirect deprivation of water, but warns at the end that this analogy must not be understood as identity. As we all know, plants resistant to drought are not always also frost resistant, and the capacity to resist low temperatures is not always accompanied by the capacity to endure severe desiccation.

The controversy concerning the difference to a frozen plant, as to whether it is thawed out quickly or slowly, is perhaps not yet altogether settled. Molisch, who has experimented with a great many different plants, reached the conclusion that a plant either is killed in the freezing or remains uninjured also when thawed out quickly. This is in contradiction with the claim of all experienced gardeners. However, one has to consider that Molisch carried out his experiments in the laboratory while the gardener is dealing with plants in the open, where the drying effect of wind and sun is frequently the actual cause of injury during the process of thawing. The shading or sprinkling with water of frozen plants

in the early morning, which the gardener claims he does in order to slow down the thawing-out process, really serves mainly to prevent undue evaporation. Some exceptional cases where quick thawing actually proved injurious while slow thawing saved the tissue (as, for instance, in the case of the leaves of *Agave americana* and flower buds of apple, which Molisch mentions) have not been explained as yet.

The so-called "burning" of evergreen leaves and "sunscald" on tree trunks or twigs is also in reality a drying out. The tissues struck by the sun are unevenly warmed up, and the water which has been drawn out of the cells by the formation of ice is more quickly evaporated than it can be replaced, since the water-carrying vessels lower down in the tissue remain cold much longer and respond only sluggishly to the sudden demand.

What causes and influences dormancy, or, as the gardener says, "ripening" of the wood, is not by any means perfectly clear. To a considerable extent it consists, undoubtedly, in an acquired habit and forms a part of the normal life cycle of a plant, most conspicuous in the plants of northern latitudes.

The physiologist, as I said, admits that hardiness in plants is a very complex problem. The gardener does not always realize that, and the layman still more is frequently confused by the injury or the death of a plant which occurs—or seemingly occurs—in the winter, but which has nothing to do with hardiness. I have in mind, in particular, conifers and other evergreens which have suffered from severe drought during the summer. They are frequently already in a hopeless condition in the fall, though they do not show it, or their balls may have become so dry that no autumn rain can wet them and the further dehydration caused by the frost may kill them. That is why it is justly recommended to water conifers in the fall, or at least to make sure that they do not go into the winter with a dry root system. Other normally hardy plants may enter the winter in a weakened condition from having been planted in unsuitable soil; sun-loving plants from having been planted in the shade, or shade-loving plants in the sun. High alpine plants, or plants from the far North which in their native habitat are able to endure much lower temperatures than we ever get, may succumb to a mild winter with us after they have been weakened by our very long growing season or by other climatic

factors which are beyond our control. Such plants usually are adapted to a long winter during which they are covered with snow, which holds an even temperature, then a sudden transition from winter to spring and a rather short summer during which they have to finish their growth. They are therefore inclined to start growth in the spring as soon as the first warm days have thawed out the ground, which frequently proves their undoing in cultivation in the lowland.

The experienced gardener knows that the way he will bring his plants through the winter depends very much on how he has treated them during the growing season and that, in particular, the following mistakes in treatment, or faulty conditions, or other factors frequently result in winter injury of some sort or other, or may cause tenderness in normally hardy plants:

1—*Late cultivation of the ground,* which induces late growth and may result in the production of tender, unripened wood.
2—*Late fertilizing* or over-fertilizing, especially with nitrogen fertilizers, which also may cause late, tender growth.
3—*Superabundance of moisture,* especially in rich soil with poor drainage, which causes a lush watery growth, suffering easily from freezing. This condition seems to favor, in particular, injury to the flower buds.
4—*Permitting the plants to suffer from drought in the summer,* which may cause a check in growth and may induce the plant to start growing again in late fall.
5—*Mulching with moisture-holding or air-excluding litter,* which may easily lead to rotting of the crowns of perennials.
6—*Permitting a smothering overgrowth* of aggressive neighbors and removing this overgrowth during the autumn cleaning.
7—*Wrong pruning,* especially sharp summer pruning of vigorous growing plants, which results in late growth and unripened wood (climbing roses).
8—*Propagation by cuttings,* which, at least with certain plants, may result in the absence of a taproot (this has been observed in particular with *Phlomis fruticosa*). The claim of many nurserymen that certain evergreens are hardier when raised from cuttings than from seeds, is not supported by facts. Seeds obtained from commercial seedhouses frequently come from southern strains which are tender, while cuttings are taken from plants which survived in the vicinity where the nurseryman is located, therefore they represent a hardier strain. This is especially true of *Thuja plicata* and *Chamaecyparis Lawsoniana.*

9—*Production of a heavy crop of fruits*, especially with grapes and certain fruit trees. The plant apparently extends its energies to the maturation of the fruits at the expense of wood and bud maturity, with the consequence that many of the unripened twigs and buds suffer frost injury during the winter. A light crop or crop failure frequently results in the following year.

10—*Individual inclination of the plant*, which closely resembles what is termed "emotional makeup" in man. Many plants vary considerably in hardiness if raised from seeds, as I had occasion to observe in particular in a set of several hundred seedlings of *Cornus Kousa* at the Boyce-Thompson Arboretum.

Similar variations I observed this spring on larger sets of seedling plants of *Albizzia Julibrissin, Castanea crenata, Diospyros Lotus, Prunus cyclaminea, Pterocarya stenoptera, Rosa omeiensis pteracantha, Stranvaesia Davidiana*, and *Cytisus scoparius*. Of all of these, some plants were killed to the ground while others remained entirely, or almost, uninjured, yet they were growing side by side under absolutely identical conditions.

11—*Exposure*. Many shrubs which during the summer are benefitted by a southern exposure, suffer during the winter more or less severely on their southern side if not shaded. Others (also young trees) suffer severe injury in southern exposure while they may pass through the winter with no, or with only slight, injury in western or even northern exposure, provided they are protected against north winds.

12—*Wrong planting*, too deep as well as too high.

13 *Late fall planting*. Perennials, especially fleshy-rooted kinds, should not be planted late. Well-established shrubs or trees withstand sudden cold spells much better than those which have been planted within the last year or two, since their far-spreading root system is better in balance with their yearly growth.

14—*Spring planting of pot-bound plants*, which therefrom get a late start and may not be able to send their roots down deep enough to withstand the winter.

15—*Neglecting to lift, divide, and replant* certain perennials at reasonable periods causes aging and weakening of the plant. Old plants which are past the prime of their life and are on the down grade are more easily injured in the winter than are younger plants. In certain woody plants, especially, the very young plant also is tender to a certain age. In some instances there appears to be even a difference in the re-

sistance of the flower buds between young shrubs and older specimens.

16—*Planting of trees which had dried out in shipment, especially in the fall.* Such trees may frequently be saved by a covering of trunk and branches with paraffin wax.

17—*Planting in so-called frost holes.* The most excellent and concise explanation of the condition termed "frost-hole" which I have found, is given in a leaflet of the Weather Bureau of the United States Department of Agriculture, entitled "Frost, when to expect it and how to prevent injury therefrom," written by W. H. Hammon, Professor of Meteorology.

It may suffice to quote here from this text, which says that: In clear, calm nights the air arranges itself in layers, according to its density. The heavier cold air rests on the ground and in the valleys flows down the slopes, accumulating on the lowest point when it can drain away no further. Places where cold air may accumulate in this manner must naturally be avoided, since especially during the vital weeks from early April to the later part of May, the temperature may drop considerably lower in such a frost-hole than on the surrounding slopes.

When, after a late spring frost, only the lower branches or buds are found injured on a shrub or young tree, while the upper parts remain intact, there is suspicion of conditions resembling a frost-hole, or at least insufficient air drainage on that particular place. When, on the contrary, for instance on a Forsythia bush, only the lowermost branches flower, the chances are that superabundance of moisture, viz., poor drainage, lowered the frost resistance of the buds. The lower branches were probably protected by snow or through shading from the upper branches.

To Increase Hardiness

Conditions which assist in bringing about or in increasing the hardiness of plants are in particular, of course, the opposite of the above.

The importance of drainage, which causes a stockier, hardier growth, I shall have occasion to point out later by examples.

A cover crop of rye, wheat, oats, barley, or buckwheat sown in the summer similarly induces earlier ripening and consequent hardier growth, by taking care of surplus moisture as well as of surplus fertilizer. Such cover crops are employed in particular in peach orchards.

Winter protection consists in most cases in a protection against winter sun, drying winds, and the violent fluctuations of temperature which this winter sun causes, rather than in a protection against cold. Wrapping up may easily be overdone and will then cause more harm than benefit. Shading with burlap, as is done for instance with boxwood, or covering with pine branches, is usually much more effective. The wrapping-up with oil-paper, as has been recommended recently for roses in popular gardening magazines, is a dangerous practice, since the oil-paper acts as a sun trap and the fluctuations of temperatures between day and night are much more extreme under the paper than outside.

Mulching, that is, a covering of the ground around the plant with leaf mould or old, well-rotted manure, can be recommended particularly for all recently planted or young plants and for all types of evergreens. Recent investigations have proved that the roots of most conifers especially remain active and continue to grow all through the winter. Since they are frequently rather shallow-rooting, the benefit derived from a mulch, which prevents violent fluctuations of the temperature of the soil, becomes easily understandable.

Report

I am now coming to the report on damages which have resulted from this last severe winter, and you are undoubtedly prepared to hear a long and sad list of losses. However, I can give you the cheerful news that the damage is by no means as serious as one might have expected. Most of the plants which I shall enumerate as having been killed altogether will hardly be known to you as outdoor plants—with the exception, of course, of the hybrid tea roses which were killed in many places, especially in light soil and where they had not been protected in the usual manner by heaping soil around the base of the bushes. The great majority of those plants had simply been under test, and, though many of them had done extremely well during the last two or three winters, I was well aware that their hardiness was doubtful and that the first really severe winter might cause their loss.

When assembling plants for a botanical collection one has to test every plant that seems to have the slightest chance to succeed, since it is impossible to know of such a plant how hardy or how

tender it may prove to be until it has been tried. Nor, as I said before, does one trial and failure ever tell a fair story.

In the above outline I explained how many factors there are which influence hardiness in plants. Not until all means have been exhausted to bring about the most favorable conditions for a plant, can it, in fairness, be called tender. Furthermore, most of the plants which I have to list today as dead, or severely injured, were plants, three to four years old, which were still in very vigorous growth. I said before that such young plants are almost always more tender than older, well-established plants. Most of these plants, also, were growing in nursery rows where cultivation had been kept up all through the summer to control weeds. This also tends to produce lush, tender growth.

HENRY TEUSCHER.

(*The death notices of the winter of 1933–34 will be given in subsequent issues of the* JOURNAL.)

NEW ROSES FROM PERSIA

Several plants of a native rose from Persia which is believed to be nowhere in cultivation in the United States have been received by The New York Botanical Garden and now are growing where their flowering can be watched, in order to check the identification. They were secured by Mrs. William H. Moore, of 4 East Fifty-fourth Street, New York, a member of the Corporation of the Garden, while on a trip in the Near East during the spring. A release from the Federal Horticultural Board, when Mrs. Moore returned to New York in May, made it possible for the Garden to receive the plants for cultivation.

REPORT OF THE SOUTHERN APPALACHIAN EXPEDITION II

(Continued from the May issue)

Turning our attention west, we went out to Newport, Tennessee, and then down to Sevierville, from there entering the Great Smoky Mountains. There we collected seed of *Cebatha carolina,* the red moonseed, a vine bearing dense clusters of red berries; *Aralia spinosa, Cimicifuga americana,* and *Senecio Rugelia,* and plants of *Stellaria pubera,* the largest-flowered of the chickweeds, not at all weedy and very attractive for a shaded spot in the rock-garden. *Cimicifuga americana* is a much more handsome plant than the common *C. racemosa,* having spikes of much larger flowers, not so stiffly erect, and much lower in height, averaging 2 3 feet. *Senecio Rugelia* is an extremely rare plant, known from only four or five stations high up in the Great Smokies. It is very unlike a *Senecio,* having large leaves somewhat similar to *Aster macrophyllus* and flower stalks with only 1–5 large drooping heads of smoky-cream-colored flowers. It is not of great beauty, but is interesting for those who desire great rarities or unusual members of a genus usually markedly different. It grows in deep, mossy humus under the light shade at the edge of hemlock and spruce forests.

Coming back into North Carolina and entering the Nantahala Gorge, we collected plants of *Cymophyllus Fraseri,* a sedge with Billbergia-like leaves and long-peduncled heads of feathery cream-colored flowers. Here also we found one plant of an albino of *Lobelia siphilitica.*

Then passing across the south end of the Great Smokies back into Tennessee, we collected seed of *Coreopsis major Oemleri*; also *Uniola latifolia,* a grass with drooping slender-branched sprays, the branches terminating in flattened, oval heads which become reddish-tinged in fall; *Helenium tenuifolium,* an annual species with very slender leaves; and plants of *Silene virginica.*

Going to Knoxville, we turned west, collecting, on the limestone bluffs of the Clinch River, seeds of *Manfreda virginica,* a relative of the agaves. *Helenium polyphyllum,* a perennial species about one foot tall with numerous brown-centered heads, was collected near Rockwood. In a river swamp several miles from Chattanooga,

we collected seeds of *Batodendron arboreum,* the tree-blueberry, with numbers of drooping white flowers; *Steironema tonsum,* a relative of the Lysimachias; *Elephantopus tomentosus,* a composite with large basal leaves and heads of lavender flowers; *Callicarpa americana,* much more handsome than the usual cultivated species but not quite hardy in the north; *Scutellaria ovalifolia,* and *Rhamnus caroliniana.*

FIGURE 5. A portion of the colony of *Parnassia asarifolia* in Neel's Gap, Ga., showing a typical healthy growth of this plant.

Turning west again, we went out to Tullahoma and back to Chattanooga, collecting along the way seeds of *Cassia marilandica,* a perennial growing 2–3 feet tall, with terminal sprays of yellow flowers; *Verbena angustifolia,* with upright spikes of small, lavender flowers; *Liatris squarrosa* and *Liatris microcephala*; *Eupatorium incarnatum,* a sprawling plant with rosy-lavender flowers; *Chrysopsis Nuttallii*; *Bradburya virginica,* a sprawling vine with lavender-purple, pea-like flowers 1–1½ inches across; and a pink-flowered, narrow-leaved *Rhexia.*

Back at Chattanooga, we ascended Lookout Mountain and there collected seed of *Silene rotundifolia* and a species of *Penstemon.* This *Silene* has round-ovate leaves and bright red flowers. It usually grows under shelving rocks, where it reaches a height of 10–12 inches. When in the open it is much lower. Going back into North Carolina at Murphy, we collected along the way seed of *Leonotis nepetaefolia,* an introduced rather weedy plant from South America; *Vernonia altissima,* and *Liatris spicata.* Near the Tennessee-North Carolina line, we collected plants of an albino of *Aster surculosus.*

Returning to Asheville, we took a run out to Chimney Rock, obtaining along the Broad River seeds of *Helianthus tomentosus,* a handsome species with large, lemon-yellow heads; and collecting on Chimney Rock Mountain seeds of *Talinum teretifolium,* a fine rock plant with slender, fleshy leaves and rosy-purple flowers; *Opulaster australis, Rhododendron minus, Coreopsis pubescens,* a *Penstemon, Rudbeckia triloba, Lonicera flava, Trautvesseria carolinensis,* two species of *Philadelphus,* and three species of *Heuchera.* It might here be stated that the eastern Heucheras cannot compare with *H. sanguinea* in showiness of flower. Their charm lies in the foliage and in the rather delicate small flowers, usually in graceful panicles.

Back at Asheville, Mr. Everett left the party and returned to New York by train. We then went down into South Carolina, collecting a few plants of *Senecio Millefolium* at Caesar's Head, and seed of *Coreopsis major* at Westminster.

Then passing over into Georgia, we zigzagged through the mountains to Blairsville, collecting *en route* seeds of *Rhynchosia erecta,* a plant about one foot tall with close clusters of pea-like, yellow flowers in the leaf-axils; *Galactia volubilis,* a sprawling or low-climbing relative of the beans, with short spikes of purplish-pink flowers; *Isopappus divaricatus,* an annual composite with a much-branched spray of small yellow heads, which should prove useful for bouquet arrangement; *Passiflora incarnata,* the native passion-flower; a dwarf *Ilex,* covered with large red berries, though scarcely a foot tall; and *Morongia angustata,* the sensitive-brier, a vine which runs on the ground, bearing mimosa-like heads of pink flowers.

In Neel Gap, south of Blairsville, we came across a large colony of *Parnassia asarifolia,* by far the finest we had yet seen. The dripping ledges in a small stream and around it were covered with thousands of plants, many of which were in full flower.

Continuing down to Atlanta, we climbed Stone Mountain and collected seeds of *Gymnolomia Porteri,* a sunflower-like annual composite, rarely exceeding a foot in height; *Coreopsis saxicola,* and *Amorpha virgata*; this being the type locality for all three of

FIGURE 6. The range of mountains in North Carolina containing Table Rock, the sharp pinnacle in the left distance. Here one views the summit cap on edge from the north. The peak in the right distance is Hawksbill, 100 feet higher than Table Rock.

these plants. We found also an *Aster* which appears to represent an entirely new group in the genus.

Going from Atlanta to Rome, we collected seed of *Brauneria pallida* and a *Penstemon.* At Rome we collected seed of two species of *Philadelphus,* one *Amorpha,* and *Clitoria mariana,* a semi-vine with pea-like, lavender flowers 1–1½ inches long.

Then turning west to Gadsden, Alabama, we collected *en route* seed of *Coreopsis tripteris,* a very tall-growing species with brown-

centered heads; *Marshallia obovata,* an *Allium, Helianthus mollis, Rudbeckia fulgida,* with intense orange-yellow rays; *Berchemia scandens,* a woody vine related to *Rhamnus,* with glossy leaves and black fruits; *Amorpha tennesscensis,* and *Vernonia flaccidifolia.* The Marshallias are a group of southeastern composites resembling the Centaureas in the appearance of the flower heads, which are very pale lavender or pinkish, but the leaves are mostly basal, and the plants average about a foot in height. They are hardy perennials, their long-stemmed heads excellent for cutting.

Returning to Chattanooga through Fort Payne, Alabama, we collected seed of *Smilax hispida*; *Ruellia parviflora,* a member of the Acanthus Family with short-lived deep-lavender flowers; and *Ilex longipes.* At Chattanooga we collected seed of *Porteranthus stipulatus.*

Going back down into Georgia, we crossed again through the mountains into Blairsville from the west, collecting *en route* seed of *Helianthus angustifolius,* a handsome species, with numerous narrow leaves and many deep orange-yellow heads with black disks; *Mimulus ringens, Steironema hybridum, Viburnum nudum, Smilax laurifolia,* an evergreen species with leathery leaves, much used for holiday decoration; *Lobelia amoena*; and *Decumaria barbara,* our native climbing hydrangea.

We returned to North Carolina at Murphy and then returned to Asheville via Franklin, obtaining seed of an *Oligoneuron* which previously had not been ripe. The Oligoneurons are related to the goldenrods, but they have flat-topped, wide-spreading heads of flowers, and very large, dock-like leaves. At Asheville we collected seed of *Helianthus giganteus* and of *Falcata Pitcheri,* a relative of the hog-peanut, *F. comosa,* but with shaggy brown hairs and rose-purple flowers.

Accompanied again by Mr. and Mrs. Clement, we made a trip into the Pisgah National Forest to explore Looking-glass Rock, altitude 4,000 feet, collecting on its summit seed of *Eubotrys recurva,* a relative of the Andromedas; *Clethra acuminata,* a tree-relative of the white alder; *Tsuga caroliniana,* the finest of the hemlocks, and *Pinus pungens.*

Then ascending Mount Pisgah, altitude 5,749 feet, we experienced the best collecting of any one spot, obtaining on that moun-

tain seeds of *Aristolochia macrophylla*; a large purple-flowered *Penstemon; Viorna Viorna; Houstonia purpurea*, a bluet relative with large ovate leaves and purplish flowers; *Hydatica petiolaris, Heuchera villosa, Pieris floribunda*, an albino of *Aster macrophyllus, Rhododendron minus, Galax aphylla, Clethra acuminata*, and a large-headed *Heliopsis* which may be a new species.

At Asheville we visited Mr. C. D. Beadle, superintendent of the Biltmore Estate, who allowed us to collect seed of *Halesia diptera*,

FIGURE 7. The east face of Table Rock, showing the 500-foot summit cliff of this spectacular peak. On the summit ledges were found *Leiophyllum Hugeri, Hudsonia montana*, and *Xerophyllum asphodeloides*.

the rarest of the silverbells, and *Ratibida columnaris* from his cultivated plants.

After making our final shipments, we bade Asheville goodbye and started our return trip, going east to Marion, collecting *en route* seed of *Lobelia puberula*, a tall species with dark blue flowers.

From Marion we went up the Linville River along a mountaintop road to Linville Falls, collecting seed of *Chamaelirium luteum*, a lily relative known as blazing star or devil's bit, with a long spike of cream-colored, feathery flowers; and *Therofon aconitifolium*,

growing on wet, dripping rock ledges, a saxifrage with foliage like that of aconite.

Crossing the Linville River, we went down the other side and took a badly wrecked road in to the foot of Table Rock, a spectacular peak 3,909 feet in altitude with a 500-foot pinnacle of stone seated on its summit. As this peak and a few neighboring ones were the only locality for *Leiophyllum Hugeri,* we ascended it and obtained seeds of that plant as well as of *Xerophyllum asphodeloides,* a lily relative with leaves like pine needles and a long-stalked head of feathery white flowers.

We then went on northeast to Blowing Rock, on whose cliffs at 3,800 feet altitude we collected seed of *Paronychia argyrocoma,* and *Liatris Helleri,* a species of blazing-star which is rarely over six inches tall in the wild state.

Near Boone we collected seed of *Aster Curtisii,* a tall species with large light blue-purple heads.

Going back through Virginia, we ascended the Peaks of Otter, altitude about 4,000 feet, where we obtained seed of *Spiraea corymbosa, Kneiffia glauca*; *Coreopsis verticillata,* a species with cosmos-like foliage; *Campanula divaricata,* and a form of *Liatris spicata,* different from that of our previous collection. *Spiraea corymbosa* is a species with flat-topped heads of flowers, the plants rarely growing over a foot tall. *Kneiffia glauca* is the best of the day-blooming evening-primroses, being a perennial with numerous stems bearing large bright yellow flowers, the stems averaging 12–15 inches in height. *Campanula divaricata* is an attractive species, growing from six inches to two feet tall in the wild state, and in almost any soil in sun or light shade. The leafy stem is very loosely much-branched, the branches spreading, ultimately drooping, well covered with nodding blue flowers about ¼ inch in diameter, the color being deeper in shady moist places than in sun, but the growth better in the sun.

Continuing north, we went out to Clifton Forge for seed of the large-flowered *Oenothera argillicola* we had seen there. After obtaining it, we went up to Hot Springs, near which we collected seed of *Hypericum prolificum* and *Helenium latifolium.* At Millboro we collected seed of *Clematis viticaulis,* this being its only known locality, and of *Eriogonum Alleni, Asclepias tuberosa,* and *Scutellaria ovata.*

Returning to the Cacapon River bluffs near Largent, West Virginia, we obtained seeds of *Oenothera argillicola; Cunila origanoides,* a perennial mint with masses of tiny rosy-lavender flowers; *Houstonia longifolia, Liatris scariosa,* and *Sorghastrum nutans,* an ornamental grass with yellow flowers and seeds. Near Berkeley

FIGURE 8. The summit cliffs of Table Rock. The dark patches are clumps of *Leiophyllum Hugeri,* the taller growth is *Rhododendron minus* and a few stunted hickories and wild cherries.

Springs, we collected seed of *Ipomoea Nil, Asclepias incarnata,* and *Ipomoea pandurata.*

We then returned to New York by way of Harrisburg, Pennsylvania, having traveled 5,766 miles in our eight weeks of absence, and collected, besides a few plants, about 375 lots of seeds.

EDWARD J. ALEXANDER.

HYBRIDS BETWEEN THE NECKLACE COTTONWOOD AND THE LARGE-LEAVED ASPEN

The two species *Populus balsamifera virginiana* Sarg. and *P. grandidentata* Michx. belong to two very distinct groups of poplars and present decided contrasts in various characteristics.

P. balsamifera virginiana is a cottonwood, having glabrous, somewhat fragrant, deltoid to ovate-deltoid leaves with acuminate apex, a truncate to slightly cordate or occasionally abruptly cuneate base, and crenately serrate margin. The winter buds are very resinous, viscid, and aromatic. Trees of this species, which is known as the necklace cottonwood, grow rather rapidly while young and they may become very large trees, with widely spreading branches. The Lafayette tree of historical associations, located near Geneva, N. Y., which is of this species and variety, has a trunk over 20 feet in circumference and a crown about 100 feet tall. This tree is perhaps 200 years old, for it was a large tree when General Lafayette visited the country more than 100 years ago. Other trees of this variety, of nearly the same age and size, are to be found at various localities in New York State.

P. grandidentata belongs in the aspen group, and is characterized by semi-orbicular to broad-ovate leaves with short-pointed apex, a rounded to abruptly cuneate, or rarely truncate base, and coarsely repand-dentate margin. The younger leaves and petioles of this species are covered with a white tomentum. The winter buds are pubescent and not resinous, viscid, or aromatic. The largest trees of this species seldom reach a trunk diameter of two feet. There is also a very marked difference between the two species in their ability to root from cuttings: cuttings of *P. balsamifera virginiana* root fairly well, whereas cuttings of *P grandidentata* root very poorly, usually much less than one per cent, under identical nursery conditions.

In 1926, in connection with a project in breeding populars,[1] seeds were obtained on a female tree of *P balsamifera virginiana* after controlled pollination with pollen of *P grandidentata,* and from this seed 178 seedlings were grown.

[1] The breeding of forest trees for pulp wood. By A. B. Stout, Ralph H. McKee, and E. J. Schreiner. Jour. N. Y. Bot. Garden **28**: 49–63. 1927.

FIGURE 1. Hybrids of *Populus balsamifera virginiana* × *P. grandidentata*, two years old from seed; showing inherent differences in vigor, and a decided resemblance to the pollen parent.

Description of the hybrids. Leaves: mostly broad-ovate, varying from almost semi-orbicular to rather narrow-ovate, dark green above, not aromatic; apex usually somewhat acuminate, varying from acute, sharp-pointed to narrowly acute, points not entire; base usually somewhat cordate, slightly rounded, varying from strongly cordate to little or not at all cordate; margin crenately serrate, incurved teeth glandular, individual seedlings varying in fineness and sparseness of the crenate serrations; texture thin, firm; younger leaves densely pubescent or tomentose. *Stems:* terete, tips of most vigorous shoots very slightly angled, at first coated with a thick hoary deciduous tomentum, later becoming olive-brown to olive-gray; lenticels oblong to linear, on older wood practically circular, usually orange-colored. *Winter buds:* terete,

rather broadly ovoid, acute; individual seedlings vary in narrowness of buds and extent to which they are appressed; buds of some seedlings slightly out-curved; color chestnut-brown; seedlings vary in amount of pubescence on buds but none are glabrous, and they are not resinous, viscid, or aromatic.

The 178 sister hybrids of this series were very uniform in respect to the general characters of leaves, buds, and stems. There was, however, much difference in vigor of growth; some of them were weak and very slow-growing, as shown in FIGURE 1. Brief mention has been made of these hybrids and one is illustrated in a recent report on the entire breeding project with poplars.[2]

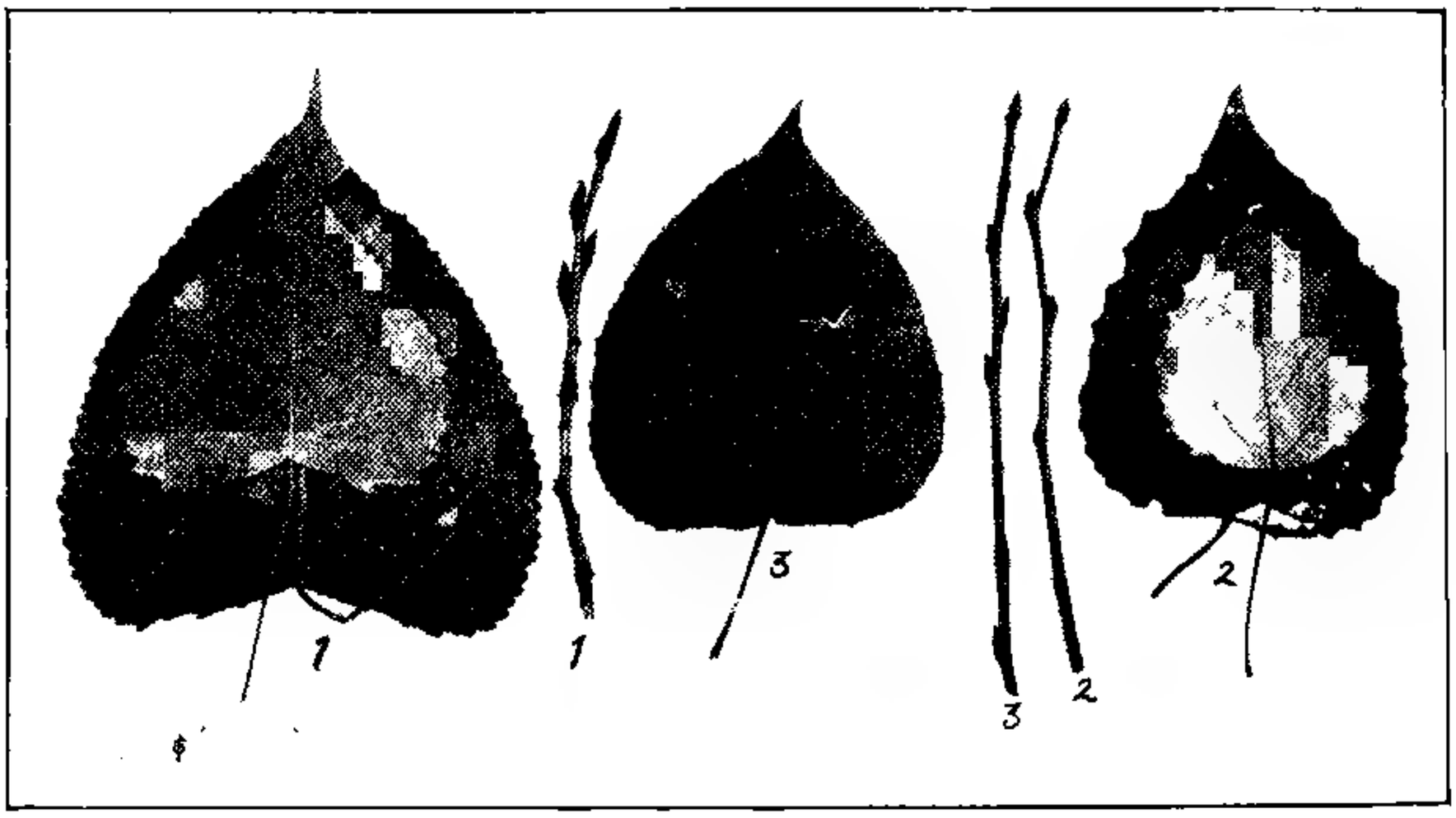

FIGURE 2. Showing large leaf of sucker branch, smaller leaf typical of old trees, and twigs of (1) *Populus balsamifera virginiana* and (2) *P. grandidentata,* and (at 3) leaf and twig of one of the hybrids.

Comparisons with parents (see FIGURE 2). The leaves of the hybrids resemble the leaves of *P grandidentata* in shape, apex, texture, color, and tomentum. The leaf base is more or less intermediate between *P. grandidentata* and *P. balsamifera virginiana*; the leaf margin resembles that of the leaves on vigorous branches of *P balsamifera virginiana* but is even more finely serrate. The stems resemble those of the *P grandidentata* in shape, color, tomentum, and appearance of the lenticels. The winter buds of the hybrids are more like those of *P grandidentata* in shape, pubes-

[2] Stout, A. B., and Schreiner, E. J. Results of a project in hybridizing populars. Jour. of Heredity **24**: 216–229. 1933.

cence, and absence of the aromatic, viscid, or resinous character. The growth thus far made by the hybrids indicates that the trees will resemble the pollen parent (*P. grandidentata*) in appearance. Thus in only a few of the characters is there definite influence of the seed parent; there is a decided dominance for nearly all the characters of the pollen parent.

The best of these hybrids are less vigorous in growth than seedlings or plants grown from cuttings of the seed parent. Most, if not all of them, appear to be less vigorous than plants of the pollen parent. They are much less vigorous than many hybrids of other crosses in the genus *Populus*. None of them has merit for use in reforestation and it is doubtful if any have merit as shade trees.

The writers have found no references to hybrids between the two species *Populus balsamifera virginiana* and *P. balsamifera*, either of wild origin or of experimental production.

A. B. STOUT,
New York Botanical Garden.
E. J. SCHREINER,
Oxford Paper Company.

TWO IMPORTANT NEW BOOKS FOR GARDENERS

L. H. Bailey and M. G. Kains—as different in style of writing as two horticulturists could hope to be—have each lately produced a new book which in its way seems quite indispensable to the gardener who wishes to know the what, how, when, and why of all that he does with his plants.

Mr. Kains's volume,[1] "Modern Guide to Successful Gardening," treats each subject particularly from the point of view of methods to be used in cultivation. The first 150 pages, approximately, deal with flowers, shrubs, vines, and trees; the next 100 with fruits and vegetables, and the last, almost 100 pages, with planning and carrying out practical work in the garden.

The emphasis on fruits and vegetables seems a trifle strong, especially when one considers that strawberries are given a whole chapter, while iris is merely mentioned in one line of one appendix; geraniums are not mentioned at all—unless in some other undis-

[1] Kains, M. G., Modern Guide to Successful Gardening. Pp. 370, illus. Greenberg, New York. 1934. $2.50.

covered line—and peonies, asters, and delphiniums are given no greater attention. But food plants have a powerful hold on many gardeners, and the book is really amazingly complete for a volume of its size. Each one of its 49 chapters, prefaced by an amusing verse and an instructive sentence, both quoted, deals with some subject that really is of prime importance for the gardener to know. The text is clear and entertaining, and is amplified by drawings, diagrams, and tables, which are further amplified by the long appendices, listing members of some two dozen groups of plants, from roses to vegetables that will withstand frost, and giving some valuable information about each.

Dr. Bailey[2] takes up the culture of nearly a thousand species of plants in alphabetical order, from Abutilon to Zinnia, listing both common and scientific names for each, and treating each subject under the name most commonly used.

Instructions are brief, necessarily, but adequate for the average gardener's use. Informative lists of perennials, annuals, vines, ground-covers, and such groups are offered, and fairly detailed directions are given for developing rock, water, and window gardens, for propagating, fertilizing, and pruning, and similar essential operations, all concise and practical.

It is strange that neither of these new books, the one by its title a "modern" guide, and the other by virtue of its authorship presumably the latest word in horticulture, mentions one of the new California plants which are becoming increasingly popular in rock gardens and borders. The names Brodiaea, Calochortus, Lewisia, and Camassia, for example, appear in neither. South African plants are almost as seriously neglected. *Ursinia anethoides* is not mentioned; Dimorphotheca is barely cited in Dr. Bailey's book, and Felicia has won a place in neither. The list might perhaps be extended, but unnecessarily. Outside of this lack, both books have outstanding value for any gardener's use.

CAROL H. WOODWARD.

[2] Bailey, L. H., Gardener's Handbook. Pp. 292, illus. Macmillan, New York. 1934. $3.00.

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THE NEW YORK BOTANICAL GARDEN
Bronx Park, New York, N. Y.

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JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

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JOHN K. SMALL

HARDINESS IN PLANTS
(Continued from the June issue)
HENRY TEUSCHER

NOTES, NEWS, AND COMMENT

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JOURNAL
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HONORS WON BY BOTANICAL GARDEN AT WESTCHESTER FLOWER SHOW

At the most extensive flower show in Westchester County's history, held June 14–19 at the County Center in White Plains, The New York Botanical Garden entered four exhibits, each of which won a high honor in a special class.

A large exhibit of wild flowers and ferns of Westchester County brought the Botanical Garden a silver cup as a special prize.

A gold medal was awarded the Garden for cut flowers of Louisiana iris, the plants of which have been collected in the South during a number of years of exploration by Dr. John K. Small, assisted by E. J. Alexander. They have since been under cultivation outdoors at the Garden. Considerable interest was expressed in the possibilities which these flowers afford as garden subjects in the North, for, with their striking tones of red and their mid-June blossoming, they offer themselves as interesting novelties.

A collection of seedling daylilies in yellow and reds, from the experimental plantings used by Dr. A. B. Stout in hybridizing for new horticultural varieties, won for the Garden a special prize of a silver medal.

Sixty varieties of roses from the Botanical Garden's outdoor collection were also awarded a silver medal.

Assembling and arrangement of the wild-flower, iris, and rose exhibits were directed by T. H. Everett and E. J. Alexander.

From the first day, according to those in charge of the Flower Show, the collection of wild flowers proved to be one of the most popular exhibits. It was constantly surrounded by visitors taking notes on the names of the plants, some of which they were planning

to bring into cultivation. Sixty species were shown, besides nine ferns and a number of grasses. Occupying 250 square feet in the center of the main floor, they were backed by tall cedar trees and flanked by ferns, with narrow-leaved cat-tails imposingly set at the two fore corners. Such flowers as pentstemons, false spikenards, wild geraniums, and moth mulleins made an especially handsome showing, while small specimens, such as the partridge berry, white clover, and shinleaf, interspersed with small ferns, made an attractive border across the front.

Each species was labeled with common and scientific name, with interesting information added about place of origin, habitat, or use. The following species were included in the exhibit:

FLOWERING PLANTS

Achillea Millefolium ..... Yarrow
Alsine longifolia ..... Stitchwort
Angelica atropurpurea ..... Angelica
Apocynum androsaemifolium ..... Spreading Dogbane
Aquilegia canadensis ..... Columbine
Carex sp. ..... Sedge
Centaurea Cyanus ..... Cornflower
Chimaphila maculata ..... Pipsissewa or Spotted Wintergreen
Cicuta maculata ..... Water Hemlock
Cirsium nutans ..... Nodding Thistle
Cornus Amomum ..... Silky Cornel, or Kinnikinnik
Cornus femina ..... Cornel, or Dogwood
Cornus rugosa ..... Round-leaved Cornel, or Dogwood
Coronilla varia ..... Crown-vetch or Axewort
Corydalis sempervirens ..... Pale Corydalis
Dactylis glomerata ..... Orchard Grass
Dianthus Armeria ..... Deptford Pink
Diervilla Lonicera ..... Bush Honeysuckle
Echium vulgare ..... Viper's Bugloss
Erigeron ramosus ..... Daisy Fleabane
Erigeron annuus ..... Fleabane
Euphorbia Esula ..... Spurge
Fragaria virginiana ..... Wild Strawberry
Galium Mollugo ..... Bedstraw
Galium verum ..... Yellow Bedstraw
Geranium maculatum ..... Wild Geranium
Heracleum lanatum ..... Cow Parsnip
Hieracium aurantiacum ..... Hawkweed, or Devil's Paint-brush
Iris versicolor ..... Iris, or Blue Flag
Kalmia latifolia ..... Mountain Laurel
Leucanthemum vulgare ..... Ox-eye Daisy
Lysimachia quadrifolia ..... Whorled Loosestrife
Medicago sativa ..... Alfalfa
Melilotus alba ..... White Sweet Clover
Melilotus officinalis ..... Yellow Sweet Clover
Mitchella repens ..... Partridge Berry
Myosotis palustris ..... Forget-me not

Notholcus lanatus . . . . . .Velvet Grass
Nymphaea advena . . . . . .Pondlily, Spatterdock, or Cow-lily
Pentstemon Digitalis . . . . . .Foxglove Pentstemon
Pentstemon hirsutus . . . . . .Pentstemon, or Beard-tongue
Potentilla recta . . . . . .Sulphur Cinquefoil
Pyrola elliptica . . . . . .Shinleaf
Ranunculus acris . . . . . .Meadow Buttercup
Rhus hirta . . . . . .Staghorn Sumac
Rosa humilis . . . . . .Pasture Rose
Rudbeckia hirta . . . . . .Black eyed Susan
Rumex Acetosella . . . . . Sheep Sorrel
Rumex obtusifolius . . . . . Dock
Sambucus canadensis . . . . . .Elder
Silene latifolia . . . . . Bladder Campion
Smilacina racemosa . . . . . .False Spikenard, or False Solomon's Seal
Solanum Dulcamara . . . . . Bittersweet
Thalictrum polygamum . . . . . .Meadow-rue
Trifolium agrarium . . . . . .Hop Clover
Trifolium hybridum . . . . . .Alsatian Clover
Trifolium pratense . . . . . .Red Clover
Trifolium repens . . . . . .White Clover
Typha angustifolia . . . . . .Narrow leaved Cat-tail
Verbascum Blattaria . . . . . .Moth Mullein
Viburnum dentatum . . . . . Arrow-wood
Vicia hirsuta . . . . . Hairy Vetch
Xolisma ligustrina . . . . . .Privet Andromeda

FERNS

Adiantum pedatum . . . . . .Maidenhair fern
Athyrium Filix-femina . . . . . .Lady-fern
Botrychium virginianum . . . . . .Rattlesnake fern, or Grape fern
Dryopteris noveboracensis . . . . New York fern
Osmunda cinnamomea . . . . . Cinnamon fern
Osmunda Claytoniana . . . . . .Interrupted fern
Osmunda regalis . . . . . .Royal fern
Polypodium vulgare . . . . . .Common Polypody
Polystichum acrostichoides . . . . . .Christmas fern

It is with great regret that we record the death, on June 25, of Dr. Nathaniel Lord Britton, Director-in-Chief of The New York Botanical Garden for the first thirty-three years of its existence. An account of Dr. Britton's life and work will appear in a later issue of this JOURNAL.

NATIVE FERNS IN THE NEW YORK BOTANICAL GARDEN

The flowerless plants—algae, fungi, hepaticae, musci, filices—are not the outstanding elements in the native vegetation of the Botanical Garden area. These plants were doubtless more prominent before modern civilization spread northward from Manhattan Island into the mainland of The Bronx, destroying much of the native vegetation first in the process of farming, later through grading and road-building.

The total number of species of fern-plants (filices, pteridophytes) native in the Garden area is not large. Compared with that of the "local flora" or the circular area two hundred miles in diameter with Manhattan at the center, it is very small. In figures it is twenty-four against eighty-seven. The number of native fern plants in the present Garden area at the time of the discovery of America can scarcely be estimated with any degree of certainty.

Ferns, through the myriad and unusual forms of their leaves, are of almost universal interest to people in all countries. Although the leaves are almost endless in design and size, yet, in their makeup there is something that renders them "ferns" to nearly everyone interested in plants, both the amateur and the professional.

Ferns are almost universal in their distribution—though there are relatively few toward the Arctic and Antarctic regions, they are very numerous in the tropics. Humid and arid regions alike support them. Their habitats run the whole scale—aquatic, terrestrial, epipetric, and epiphytic. The aquatic species may thrive in fresh, in brackish, or in salt water; the terrestrial in acid, neutral, or alkaline soil; the epipetric on igneous or sedimentary rocks; the epiphytic on almost any kind of tree or shrub with bark that does not easily peel.

As one views the upward scale of the plant kingdom there seems to be a great gap in habit, at least between the higher bryophytes—hepatics and mosses—and the ferns. This gap is more apparent in temperate regions than in the tropics. In the more humid tropics there have been developed groups of fern-plants that simulate the higher bryophytes both in size and in general appearance, popularly known as filmy-ferns. In these groups a whole fern-plant may not be larger than a leaf of some mosses or the thallus of some hepatics.

Somewhat removed from the "true ferns" are plants that are not so readily recognized as fern-relatives. These fern-relatives also occupy all kinds of habitats. They vary in habit. *Marsilea* has leaves that resemble those of a clover; *Isoëtes* resembles a grass; *Azolla* and *Salvinia,* floating plants, resemble some of the hepatics; *Lycopodium* and *Selaginella* resemble mosses, while *Equisetum* resembles rushes.

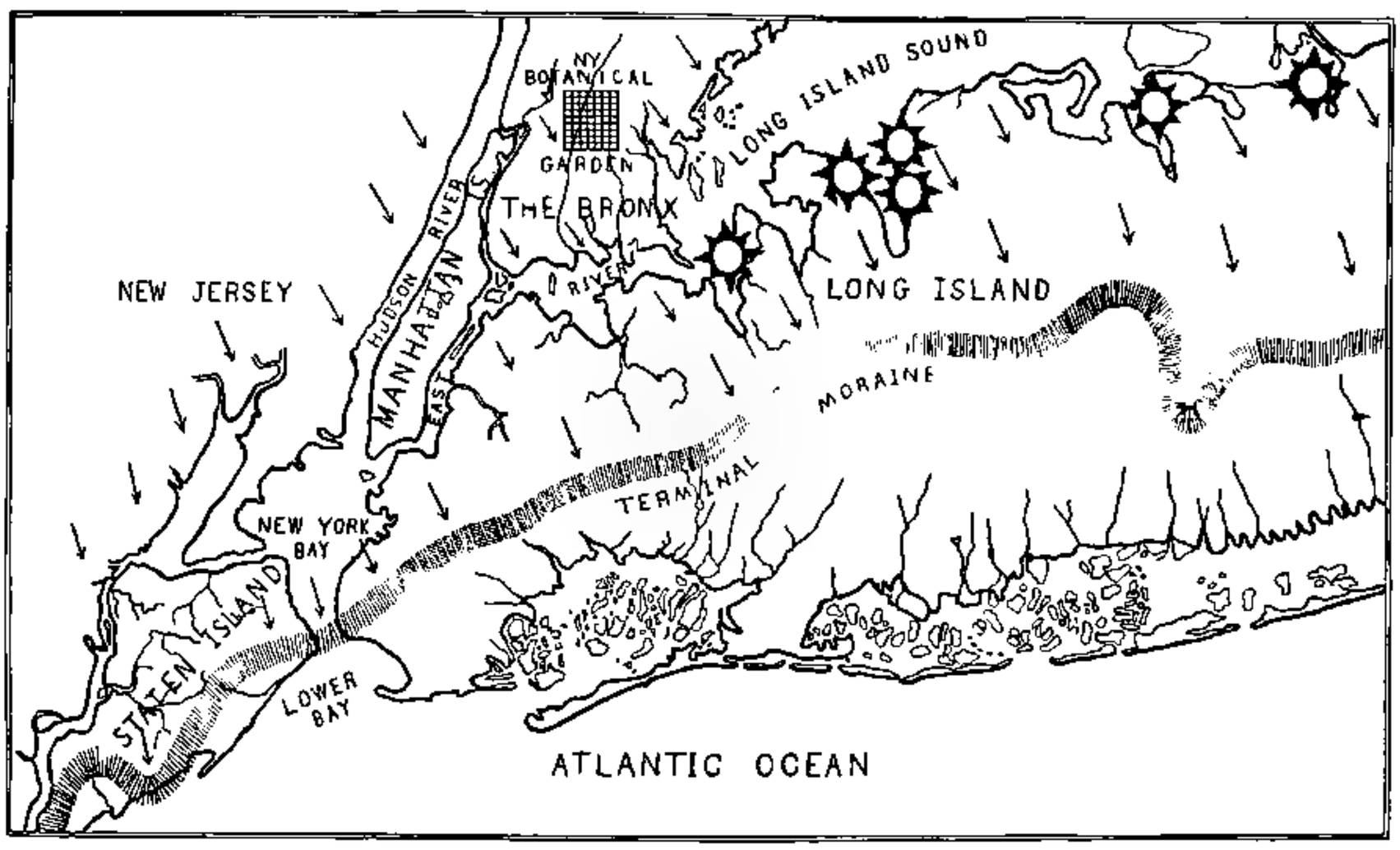

FIGURE 1. Map showing the position of The New York Botanical Garden in relation to local glaciation and the terminal moraine on Staten Island and on Long Island. The stars on the northern side of Long Island indicate where the remains of the predecessors of our flora, ferns and flowering plants, are preserved as fossils in the Cretaceous deposits.

Although there is considerable variety among the native fern-plants of the Garden, the very small filmy-ferns referred to above do not come nearer to the Garden than the southern tip of the Florida peninsula. However, a larger-leaved *Trichomanes* does range from Alabama northward to Kentucky. On the other hand, several of the more common kinds of ferns native in the Garden range all the way from where the "filmies" just referred to grow in Florida, up to the Garden area and still further north, where they migrated after the retreat and elimination of the glaciers of the Ice Ages.

As compared with the flowering plants—trees, shrubs, and herbs—the fern-plants now play a minor rôle. In a former geologic

age they played the principal rôle among plants on the earth's surface, the living species probably being outnumbered by the known extinct ones, and there must have been more which were not preserved in fossil form.

Pteridophytes appeared on the earth early in the Paleozoic Era, reached their greatest abundance in Carboniferous time, and have since dwindled in numbers as the higher plants have increased.

The pteridophytes of the Carboniferous were great contributors to the organic deposits which formed our present-day coal-beds. Today the aquatic and palustrine ferns contribute humus as a result of decay. The terrestrials serve further to pulverize soil and add some humus largely *in situ*; the epipetrics serve to disintegrate the rocks on which they grow, and, also like the epiphytes, contribute small amounts of humus, which, however, is scattered by the winds and thus collected only in more or less distant localities.

The present native fern-population of the Garden had its beginning after the local region was sufficiently restored, following the Ice Ages, to inhabitable conditions. Fern plants similar to present-day forms developed in the later Cretaceous and continuing through the succeeding times are the direct or indirect ancestors of our ferns. Those that survived the Ice Ages by migrating southward returned to the reconstructed area after the retreat of the latest ice-sheet.

The fossil evidence shows that woody plants greatly dominated the vegetation previous to the advent of the Ice Ages. However, this preponderance of shrubs and trees may be only apparent, for the tissues of these plants are more readily adapted to preservation in fossil form than are those of herbaceous plants. However, the remains of herbaceous plants are surprisingly small—five herbaceous against 211 woody. To the five herbaceous plants might be added the six fern plants with which we are concerned in this article. The genera of fern plants recorded in the Cretaceous fossils of southern New York and New England are as follows: *Glcichenia* (2 species), *Thyrsopteris* (1 species), *Onoclea* (1 species), *Marsilea* (1 species), *Sagenopteris* (1 species).[1] Naturally

[1] Fossil specimens of ferns and fern relatives have been found at Glen Cove, Manhassett Neck, and Little Neck, on Long Island; on Block Island; and on Martha's Vineyard.

s, a list of six species, is a very small representation of ferns for arge area, thousands of square miles, for today, after man's vastation of the four hundred acres comprising The New York tanical Garden, we find a list of twenty-four species as shown the accompanying list.

	Fla.	Ga.	S. C.	N. C.	Va.	Northern Limit
trychium obliquum	×					N. B.
trychium dissectum	×					Me.
lypodium vulgare		×				Lab.
plenium platyneuron	×					Me.
hyrium asplenioides	×					Newf.
yopteris noveboracensis		×				Newf.
yopteris Thelypteris	×					N. B.
yopteris simulata				×		Me.
yopteris cristata				×		Newf.
yopteris marginalis		×				N. S.
yopteris intermedia				×		Newf.
yopteris hexagonoptera	×					Que.
yopteris Dryopteris				×		Newf.
lystichum acrostichoides	×					N. S.
ix fragilis		×				Newf.
nnstaedtia punctilobula		×				N. S.
oclea sensibilis	×					Newf.
muda regalis	×					Newf.
munda cinnamomea	×					Newf.
uisetum arvense				×		Newf.
uisetum fluviatile					×	N. S.
uisetum hyemale		×				N. S.
'aginella apus	×					Me.
aginella rupestris		×				Me.

The ferns of the Garden are species of wide geographic distribun. Considering the Atlantic states south of Virginia we find at eleven species, or nearly 46 per cent, range from Florida northrd and beyond into more boreal regions; eighteen species, or arly 77 per cent, range from Georgia northward; twenty-four ecies, or 100 per cent, range from Virginia northward.

It is plain that the native ferns and fern-relatives of the Garden present widespread species of woodlands and swamps. All but e of them, *Onoclea,* the sensitive-fern, are quite different from e kinds that the fossil records show as the preglacial assemblage the region hereabouts.

JOHN K. SMALL.

HARDINESS IN PLANTS

(*Continued from the June issue*)

Here are the death notices of plants around New York after the severe winter of 1933-34:[1]

Berberis Sargentiana and *V. Veitchii* (even on L. I.) –killed to the ground.
Berberis Soulieana and *B. Juliana* (very severely injured in most places).
Berchemia Giraldi—dead.
Buxus microphylla -very severely injured, recovery doubtful.
Callicarpa americana—killed to the ground and probably dead.
Celastrus Rosthornii—dead.
Cistus villosus—killed to the ground and probably dead.
Clematis montana rubens—killed to the ground and probably dead.
Clematis montana Wilsonii—killed to the ground and probably dead.
Cotoneaster pannosa—dead (even on L. I.).
Cryptomeria japonica elegans—(N. Y. B. G.)—dead.
Desmodium Dillenii—dead.
Dipelta floribunda—killed to the ground and probably dead.
Dipelta yunnanensis—severely injured, probably dead.
Ephedra foliata—dead. (Several other species slightly or not injured.)
Erica ciliaris and *E. scoparia*—dead.
Erica vagans—severely injured in most places, even on L. I. (much more than *E. carnea* and *E. tetralix*).
Escallonia hybrida Edinburgh—dead.
Evonymus japonica microphylla—severely injured, probably dead.
Garrya elliptica (in B. B. G.)—apparently dead.
Gelsemium sempervirens (on L. I. under protection)—dead.
Hypericum olympicum (in some places)—dead.
Hypericum patulum uralum -dead. (*H. patulum Henryi* and *grandiflorum* —killed to the ground in most places but not dead).
Hypericum calycinum and *H. Androsaemum* dead.
Lagerstroemia subcostata—dead.
Ligustrum compactum—killed to the ground, probably dead.
Ligustrum Delavayanum severely injured.
Lonicera angustifolia -killed to the ground and probably dead.
Lonicera nitida—killed to the ground.
Loropetalum chinense (in B. B. G.)—apparently dead; in sheltered places on L. I. only slightly injured.
Magnolia grandiflora—seriously injured, recovery doubtful (young plants).
Microglossa albescens –dead (even on L. I.).
Osteomeles anthyllidifolia—dead.
Osteomeles Schwerinii—severely injured even in sheltered place.
Phlomis fruticosa—dead.
Picea Sargentiana and *P. likiangensis*—all needles killed, recovery doubtful.
Pinus Coulteri, P. radiata, P taiwanensis, P. Montezumae, P. Taeda—all needles killed, trunks appear sound but probably doomed to die.
Piptanthus nepalensis dead.
Podocarpus macrophylla—dead.
Polygonum multiflorum—dead.
Pyracantha angustifolia—dead (even on L. I.).

[1] In this report the following abbreviations are used: N. Y. B. G.—New York Botanical Garden. B. B. G.—Brooklyn Botanic Garden. B. T. A.—Boyce Thompson Arboretum. L. I.—Long Island.

:antha crenulata kansuensis and *P. Gibbsii*—killed to the ground in ıost places (not seriously injured on L. I.).
ınus lycioides—dead.
odendron ambiguum and *R. Searsii* -dead. Also undoubtedly many ther Asiatic species on which I had no opportunity to check up.
succedanea—probably dead.
)ia sempervirens (5 ft. tall, with a spread of 10 ft.)—in sheltered place ı B. B. G., killed to the ground.
europaeus—well established plant in favorable locality in B. T. A.—ead. (A report from L. I. mentions *U. europaeus* as having been lightly burned in light, dry soil and not at all injured in heavier soil.)
betulifolia, V. Davidii, V. palmata, V. Piasezkii Pagnucci, V. Ro-ıanetii and many other species of *Vitis* have been quite severely in-ured.
)nly *Vitis Longii* and *V. vulpina syrticola* escaped with slight injuries.
'itis amurensis was variously injured in different places, in some seri-usly, in some slightly; reason for difference not determined.
'itis Coignetiae was comparatively slightly injured at the B. T. A., vhere it was trained up, and escaped without injury at the N. Y. B. G., vhere it was allowed to trail on the ground.
ıoxylum ailanthoides—dead.

More or Less Severe Injuries to Interesting Plants

is noticeable that the majority of trees and shrubs were much : severely injured on their eastern and, especially, on their ıern side, than on their western or northern side. On the ts of shrubs and on the trunks of young trees bark and cam- ı were frequently killed all along the southern side, while the ıern side remained intact. In many instances this injury was :vere that it may lead to the death or the permanent crippling e plant.

a grandiflora—killed to the ground in most places.
thopanax ternatus and *A. trifoliatus*—killed to about snow line.
argutum—slight injury to tips.
japonicum—tips injured, while *A. palmatum* and its varieties are al-ıost uninjured.
: jorullensis—killed to the ground but not dead.
'lopsis megalophylla—killed to the ground.
nanthe aspera—killed to the ground but not dead.
nisia abrotanum—only tips killed.
ina parviflora—killed almost to the ground but not dead.
'haxis spinosa—killed almost to the ground (wet place).
lex canescens—killed to the ground but not dead.
aris halimifolia—on old plants in dry place, most one-year-old and ıuch of two-year-old wood killed. Young plants in wet place killed) the ground.
'ris verruculosa—leaves burned and many twigs killed, but will re-)ver. Injury varies in different places.
'ris Gagnepainii—more severely injured than *B. verruculosa.*
ris triacanthophora—seriously injured. Five-foot plant killed to the round.

Berberis pruinosa—many leaves and some twigs killed but plants not seriously injured.
Berberis aristata, B. Coryi, B. concinna, B. buxifolia, B. replicata, B. Wilsonii, B. Stapfiana, B. stenophylla, B. polyantha and *B. virescens*—killed to snow line.
Broussonetia papyrifera—killed to the ground.
Calluna vulgaris var. *alba rigida,* var. *alba erecta* and var. *humilis*—injured less than other varieties.
Calluna vulgaris compacta—has come through this winter better than most previous winters. Some fifteen other varieties were all more or less injured, but none seriously.
Callicarpa japonica and *C. Shirasawana*—killed to the ground.
Campsis radicans and *C. hybrida*—variously injured, depending on exposure, soil conditions and pruning. In many cases killed to the ground.
Campylotropis macrocarpa—killed to the ground, in wet place.
Carpinus Tschonoskii—killed back to two-year-old wood, in some instances as much as two feet from tips down killed.
Castanea Henryi—only tips killed.
Catalpa Duclouxii—young twigs of older tree partly killed.
Ceanothus americanus—killed to the snow line.
Cephalotaxus drupacea—needles partly burned but plants not seriously injured; var. *fastigiata* seriously injured.
Cephalotaxus Fortunei many needles and some twigs killed even in sheltered place, but will quickly recover.
Cedrela sinensis—young plants in nurseries were killed almost to the ground but their rootstocks are alive. Several tall trees (over twenty years old) in N. Y. B. G., growing on a protected dry slope, were apparently seriously injured. Their chances of recovery are still uncertain. (They seem to have suffered injury to their roots.)
Cedrus atlantica—most needles killed but twigs and buds uninjured. (Old trees.)
Cedrus Deodara and *C. libanotica*—all needles killed but otherwise hardly injured. Will recover easily (only young plants observed).
Chaenomeles lagenaria var. *cathayensis* and var. *Wilsonii* (6–9 ft.)—killed almost to the ground.
Cistus laurifolius killed to the ground in southwestern exposure under otherwise favorable conditions; less seriously injured in northeastern exposure.
Clematis—many species killed to the ground. Little injured were: *C. koreana, C. orientalis, C. Pierotii, C. viticella, C. brevicaudata, C. serratifolia.* Even *C. paniculata* was killed back rather severely though not to the ground.
Clerodendron trichotomum—killed to the ground.
Colutea persica and *C. gracilis*—killed to the snow line. Most other species show only slight injury to tips.
Corylopsis Willmottiae—killed to the ground, while *C. spicata* and *C. pauciflora* remained uninjured.
Cotoneaster prostrata—killed back to two-year-old wood.
Cotoneaster frigida montana—killed to the ground.
Cryptomeria japonica—younger plants, especially, more or less severely injured.
Cryptomeria japonica var. *elegans,* a fixed juvenile form -killed at N. Y. B. G.
Cupressus arizonica and *C. Macnabiana*—quite seriously injured but will recover.
Cytisus ciliatus Griesebachii—killed to the snow line.
Dorycnium suffruticosum—killed to the ground.

Dorycnium hirsutum—killed to the snow line.
Elaeagnus pungens—all leaves and most branches killed.
Elsholtzia Stauntonii—killed to the ground in most places.
Fontanesia phillyreoides—most branches killed back to two-year- or three-year-old wood.
Fontanesia Fortunei—only some of the utmost tips injured.
Fraxinus potamophila, F. xanthoxyloides, F. numidica—killed to about the snow line.
Fraxinus angustifolia (9 ft.)—only tips injured.
Hedera Helix, as well as var. *arborea* and var. *conglomerata*—badly burned and in many cases severely killed back.
Hedera colchica killed to the ground.
Helianthemum canum, H. Kotschyanum, H. ledifolium, H. alyssoides and others—tips killed but plants not seriously injured.
Helianthemum apenninum—old plants killed; self-sown young seedling plants uninjured.
Holodiscus discolor—killed to the snow line.
Hovenia dulcis (8 ft.)—in B. B. G., on well-drained, sheltered slope, one-year- and two-year-old wood killed.
Hydrangea stellata rubra—killed to the snow line; also *H. macrophylla* and *H. quercifolia.*
Hydrangea radiata—killed almost to the ground in one place where it had been transplanted and pruned sharply during the previous spring.
Hyssopus officinalis—killed to about the snow line.
Ilex Aquifolium, I. cornuta and *I. Pernyi*—quite seriously injured and killed back to the snow line, even in sheltered places and under lath shades.
Ilex crenata—injury varies greatly with locality and exposure but does not seem to be serious anywhere.
Ilex integra—killed to the ground (young plants).
Itea virginica—variously injured in different places; in some places killed to the ground and in others only tips slightly injured.
Jasminum nudiflorum—killed to snow line in many places where not protected. Only tips injured and some flower buds killed where sheltered or protected.
Juniperus monosperma most needles browned and killed but twigs uninjured. Will recover.
Juniperus pachyphloea—slight injury on lower twigs, in somewhat sheltered place.
Kerria japonica—tips and many twigs killed but not seriously injured. Injured little in sunny, well-drained positions in poor soil.
Koelreuteria apiculata and *K. paniculata*—only some of the utmost tips injured.
Koelreuteria integrifolia (8 ft.)—one-year-old wood killed.
Lagerstroemia indica rather severely killed back but will recover.
Lespedeza bicolor and *L. formosa*—killed to the ground in most places.
Leycesteria formosa—killed to the ground.
Ligustrum Quihoui—killed to the ground, while *L. ovalifolium aureum* and *argenteo-marginatum,* as well as *L. Ibota Vicaryi* show only slight injuries to the tips.
Ligustrum ovalifolium—hedges have suffered more or less severe damage in most places, but sharp pruning will quickly restore them.
Lonicera Periclymenum, L. sempervirens and *L. pileata*—only slight injury to tips.
Lonicera trichosantha, L Standishii praecox and *L. gynochlamydea*—killed to the snow line.
Neillia affinis, N. sinensis, N. thibetica—killed to the snow line or almost to the ground in most places.

Orixa japonica—slight injury to tips in somewhat moist place; in perfect condition elsewhere.
Osmanthus ilicifolius—killed to the ground but not dead.
Osmaronia cerasiformis—killed to the ground everywhere.
Paederia chinensis—killed to the ground.
Paeonia lutea—killed to the ground.
Parthenocissus tricuspidata—killed back no more than in most winters.
Parthenocissus tricuspidata var. *minutifolia*—severely injured.
Pernettya mucronata—killed almost to the ground even on L. I., and even under protection elsewhere.
Perowskia atriplicifolia—killed to the ground.
Phillyrea decora—killed to the snow line.
Photinia Beauverdiana—killed almost to the ground.
Phyllostachys Nevinii, and several other species of *Phyllostachys* and *Sasa*—killed to the ground but roots not injured.
Platanus Wrightii—twigs killed to two-year-old wood.
Polygonum Auberti—many twigs killed but plants not seriously injured.
Poncirus (or *Citrus*) *trifoliata*—all young twigs dead but injuries not serious; uninjured in sheltered places.
Potentilla fruticosa parviflora and one type of the species only slightly injured, while most other varieties were killed to the snow line in moist, well-cultivated nursery. Not injured elsewhere.
Potentilla Salesoviana—killed almost to the ground.
Prunus Conradinae, P. communis amara, P. scoparia, P. Webbi—killed almost to the ground.
Pyracantha coccinea—leaves partly burned and twigs killed back more or less severely in different places. Not seriously injured, however, and will quickly recover.
Quercus lanuginosa—tips of young plants slightly injured.
Raphiolepis umbellata (young plant)—leaves killed and tips injured but will recover.
Rhamnella franguloides—killed to the ground but not dead.
Ribes fasciculatum chinense—tips and buds killed.
Ribes sanguineum, R. Meyeri and *R. bracteosum*—killed almost to the ground.
Rosa Lambertiana—all varieties more or less severely injured. (Plants were transplanted and pruned sharply last spring.)
Rosa Roxburghii, R. Watsoniana, R. Moyesii, R. omeiensis, and *R. multibracteata*—killed almost to the ground.
Rubus leucodermis, R. Henryi, R. Parkeri, R. thibetanus, R. parviflorus, R. ulmifolius, R. setchuenensis and *R. biflorus quinqueflorus*—killed almost to the ground.
Salix Bockii—killed to the snow line.
Sambucus nigra pyramidalis—in dry, well-drained place injured only on tips. In moist place killed to the ground.
Sambucus nigra nana bicolor—killed to snow line (much more tender than the other varieties, most of which showed no injury).
Securinega flueggeoides—about one-half of one-year-old wood killed.
Sequoia gigantea—variously injured in different places. In one instance, in an exposed position, some plants of a row of seedlings four feet high were found alive to their tips, showing only slight injury on their lower twigs, while others in the same row were killed from the tips down to about one foot from the ground.
Sophora viciifolia—some tips injured and some branches killed but not seriously damaged (under favorable conditions).
Sorbaria sorbifolia and *S. Lindleyana* –killed to the ground or almost to the ground, while *S. Aitchisonii, S. arborea* and *S. assurgens* have escaped with no, or only slight, injury.

Spiraea Sargentiana, S. expansa, S. bella and *S. Rosthorniana*—rather seriously injured in many places but not everywhere.
Spiraea japonica and *S. Bumalda* Anthony Waterer—in most places killed to the snow line; *S. Bumalda Froebeli*—injured only on tips.
(*S. albiflora,* the other parent of *S. Bumalda,* was not injured.)
Spiraea decumbens—killed almost to the ground in dry as well as moist places.
Spiraea bullata—killed to the ground.
Staphylea colchica Coulombieri—young plants in moist nursery—much more seriously injured than *S. colchica,* which showed only slight injury to tips. Old plants on partly shaded but well-drained slope were not injured.
Styrax japonica Fargesii—rather severely injured, while the species remained unharmed.
Taxodium mucronatum (young plants 3–4 ft.)—killed almost to the ground but not dead.
Taxus baccata (especially var. *fastigiata*) and *T. canadensis*—more or less seriously burned and injured.
Taxus chinensis—only very slightly injured in sheltered place.
Taxus cuspidata—hardly injured.
Teucrium Chamaedrys—variously injured, especially on the south side of the bushes. Almost perfect in somewhat moist place shaded from south.
Teucrium montanum—only very slightly injured.
Torreya nucifera—part of the needles burned but injury not serious.
Viburnum brevipes and *V. dasyanthum*—killed to the snow line.
Viburnum cotinifolium slightly injured, especially tips.
Vitex Agnus-castus killed to the ground.
Vitex incisa—not more seriously injured than in other winters.
Zanthoxylum simulans (*Z. Bungei*) killed back rather severely, while *Z. schinifolium* is only very slightly injured on tips.
Zanthoxylum piperitum (4½ ft. tall)—killed to about one foot from the ground.

Interesting Differences between Plants in Different Localities

It was my lucky chance that I could extend my observations on hardiness for this report to the collection of 4200 species and varieties of woody plants contained in the nursery of the Boyce Thompson Arboretum, which I have watched for the last five years. Since all of these plants are growing there in the nursery under as nearly identical conditions as can be had for such a large collection, the observations are of particular interest. It has to be understood, however, that the conditions in this nursery are not very favorable for bringing about hardiness, which explains why I am not at all discouraged by the list of injuries which I have just read to you. I am convinced that many plants which have been killed back to the snow line in this nursery will be hardy under conditions which are more suitable for them. The nursery is located in a valley extending from north to south. In places this valley is rather wet and

tends to act as a frost hole. The soil in general is quite acid and fairly rich.

A feature of particular interest is that two years ago The New York Botanical Garden obtained plants of over one thousand varieties from the Boyce Thompson Arboretum, which were planted here at this Garden on a slope, facing south, in poor shale soil. The comparison of the behavior of the plants of the same age and origin under so widely different conditions is extremely interesting.

Araucaria araucana—young plant (1½ ft.) in sheltered place in B. B. G. was found in perfect condition. A slightly larger plant in an open, somewhat moist position at the N. Y. B. G. was very severely injured.

Campsis radicans and *C. hybrida*—killed almost to the ground in one place at the B. T. A. and only slightly injured in another.

Caryopteris mongolica in B. T. A. killed to the ground; at N. Y. B. G. almost uninjured.

Celastrus angulata—at B. T. A. killed to the ground; at N. Y. B. G. uninjured.

Cercis chinensis—at B. T. A. killed to the ground; at N. Y. B. G. only a few tips killed; flower buds uninjured.

Deutzia (more than 30 species and varieties) had been transplanted at the B. T. A. last spring at which time they were pruned very sharply. All of these, including even the hardy *Deutzia scabra* and its varieties, were killed down to the ground. At the N. Y. B. G., *D. scabra* and its varieties, *D. Sieboldiana,* and *D. discolor,* suffered no injury at all. *D. glomeruliflora* suffered slight injury, while all the others were killed back seriously.

Deutzia hybrida Mont Rose, at the B. T. A. in one place where it had been neither transplanted nor pruned came through the winter without any injury, while plants of the same set at the N. Y. B. G. were killed to the ground.

Firmiana simplex—15-ft. tree on dry, sheltered slope in B. B. G., showed injury only to some tips. Younger plants (7 ft. tall) in moist nursery in B. T. A. were killed almost to the ground.

Helwingia japonica—in dry locality in B. B. G. showed only slight injury to some tips. In the moist nursery of the B. T. A. plants were killed to the ground.

Hibiscus syriacus—at B. T. A. killed almost to the ground; at N. Y. B. G. in perfect condition.

Libocedrus decurrens—in sheltered valley, uninjured except slightly burned on south side; in nursery, probably dead even under lath shade.

Lonicera Henryi, L. alseuosmoides and *L. japonica*—in perfect condition and almost evergreen in shady places where trailing over the ground or over low stone walls. More or less seriously injured in the sun where trained upon wires or stakes or where pruned.

Nyssa aquatica—at B. T. A., at one place killed to the ground and probably dead; in another place, only tips injured.

Philadelphus purpureo-maculatus—all varieties, with the exception of *Belle Etiole,* were killed to the ground at the B. T. A.; at N. Y. B. G. all varieties survived with only slight injury to the tips of the shoots.

Platycarya strobilacea—at B. T. A., killed to the ground; at N. Y. B. G., not injured at all.

Pseudotsuga taxifolia—from Howe Sound, severely burned and injured.

Pseudotsuga taxifolia—Shuswap strain entirely uninjured.

Rubus deliciosus—one lot of seedlings killed almost to the ground; one lot of seedlings only slightly injured on tips.
Spartium junceum—at B. T. A. killed to the ground, perhaps dead; at N. Y. B. G. only young tips killed.
Stephanandra incisa—at B. T. A. killed almost to the ground; at N. Y. B. G. uninjured.
Styrax americana—at B. T. A. killed to the ground; at N. Y. B. G. only small tips injured.
Symphoricarpos Chenaultii—at B. T. A. killed almost to the ground; at N. Y. B. G. uninjured.
Tamarix gallica—at B. T. A. killed almost to the ground; at N. Y. B. G. uninjured.
Taxodium distichum pendulum—seriously injured in moist nursery; uninjured in dry place (young grafted plants 3 ft. tall).

Anemone Pulsatilla: A number of old, well-established plants, in rich garden loam, in a lower part of my garden, did not produce one flower this spring, though they are alive and in April brought forth their leaves. Other plants of the same age, on a dry, gravelly slope, appeared in full flower, which shows how much soil conditions matter. The exposure of both sets of plants is almost identical. The plants in the rich, rather moist loam were, in other years, always the first to flower in early March, the others flowering one or two weeks later.

Injury to the Flower Buds of Spring-Flowering Trees and Shrubs

This type of damage is very widespread this spring and it is interesting to observe how this injury also varies with the locality. The influence of the water content of the tissues is very apparent and undoubtedly also explains why the buds on young, vigorous, growing plants are in general much more seriously injured than those of older trees which have settled down to a sturdier, steadier growth. Most of the trees and shrubs enumerated below suffered injury to their buds especially, or solely, in poorly drained localities and in southern or eastern exposure, or on the southern or eastern side of the plants.

Amelanchier canadensis—flower buds killed on young plants in wet place.
Cornus Kousa—at N. Y. B. G. and elsewhere, many flower buds killed.
Daphne Genkwa—most flower buds killed.
Daphne Giraldii—some flower buds killed.
Enkianthus campanulatus and *E. perulatus*—all flower buds killed at B. T. A.; at N. Y. B. G. entirely uninjured.
Forsythia suspensa and *F. intermedia*—majority of flower buds killed in many places; less severely injured on gravelly slope and northwestern exposure. *F. intermedia,* in general, gave a better display of flowers than *F. suspensa.*
Forsythia viridissima and *F. viridissima koreana*—less severely injured.
Leucothoë racemosa—flower buds killed.
Magnolia Soulangeana—most flower buds killed. Less seriously injured in sheltered places.

Mahonia Bealii and *M. Aquifolium*—flower buds killed in most places; also many leaves burned.
Paulownia tomentosa—flower buds killed.
Pieris japonica—flower buds killed everywhere; in exposed position also most leaves and many tips.
Prunus amygdalo-persica—flower buds and many twigs and some branches killed.
Prunus Armeniaca—flower buds killed; only slightly injured otherwise.
Prunus Davidiana—flower buds killed in most places.
Prunus glandulosa—most flower buds killed and some tips killed.
Prunus incisa—flower buds killed; otherwise uninjured.
Prunus pendula—flower buds killed; otherwise uninjured.
Prunus Persica—most flower buds killed in many places but not everywhere.
Prunus serrulata pubescens and most other Japanese cherries—flower buds injured or killed.
Prunus tomentosa and *P. pumila*—only part of flower buds killed in unfavorable locality.
Prunus triloba—most, but not all, flower buds killed in unfavorable position.
Rhododendron hybrids—flower buds killed except on northwest side of sheltered bushes. Boule de Neige, a low, compact variety, seems to have suffered less than most of the others. Also the following rhododendrons lost their flower buds:

R. arborescens (in some places).
R. catawbiense—uninjured in northwestern exposure.
R. Gowenianum.
R. Hinodigiri—also tips and many twigs injured.
R. micranthum.
R. dauricum and var. *mucronulatum.*
R. mucronatum (*ledifolium*)—in most places.
R. obtusum amoenum and *R. obtusum Kaempferi*
R. racemosum—also leaves and tips injured.
R. Smirnowii.
R. Wilsonii.
R. Weyrichii.
R. viscosum -in most places.

Styrax japonica—buds killed in some localities.
Wistaria—flower buds killed in some localities. (*Wistaria japonica*, young plants killed to the ground, the only species which was injured seriously).

Flower Buds Which Survived the Winter

The following trees and shrubs showed no injury to their flower buds, even under not particularly favorable conditions:

Acer rubrum.
Aronia arbutifolia and *A. melanocarpa.*
Amelanchier—(12 species).
Benzoin aestivale.
Cercis canadensis and *C. chinensis*—in N. Y. B. G. and elsewhere in well-drained soil.
Chaenomeles japonica.
Cornus florida—in most localities, though in many instances the two outer bracts were crippled or remained undeveloped, leaving the flowers with only two bracts.
Cornus Mas.
Cornus orientalis.
Corylopsis pauciflora (*Corylopsis spicata* buds partly injured).

Cytisus pilosus.
Cytisus praecox.
Daphne Cneorum.
Daphne Mezereum.
Enkianthus campanulatus, E. perulatus, E. subsessilis (in dry soil).
Exochorda racemosa, E. Giraldii var. *Wilsonii, E. Korolkovii.*
Forrestiera acuminata
Forsythia ovata (also *F. japonica saxatilis* at Arnold Arboretum).
Fothergilla major and *F. monticola.*
Hamamelis japonica, H. vernalis, H. mollis.
Halesia carolina and *H. monticola.*
Iberis sempervirens.
Kalmia latifolia.
Lonicera fragrantissima and others.
Magnolia acuminata, M. cordata, M. Fraseri, M. tripetala
Magnolia Kobus and var. *borealis*—almost no injury to the flower buds (best of all the early flowering kinds).
Magnolia stellata—escaped injury in many places but not everywhere.
Malus (apparently all species and all the hybrid crab-apples)—no injury observed.
Pieris floribunda.
Philadelphus (most species and varieties).
Prunus avium and var. *plena.*
Prunus Cerasus; also *Prunus subhirtella* (on dry hill), while *P. pendula* lost most of its flower buds.
Prunus japonica (in all its varieties).
Prunus nana.
Prunus serrulata sachalinensis (Sargent's cherry). The only double-flowered Japanese cherry which gave a satisfactory display of blossoms this year at the N. Y. B. G. was the pale pink var. *Prunus serrulata sachalinensis alba-rosea* (Shirofugen).
Prunus tomentosa and *P. pumila*—in sheltered places.
Rhododendron canescens.
Rhododendron carolinianum and *R. maximum*—where not exposed to east and south.
Rhododendron japonicum and several of the "Ghent Azaleas" (*R. gandavense*).
Rhododendron nudiflorum.
Rhododendron roseum.
Rhododendron yedoense poukhanense—in most places especially where somewhat sheltered.
Schizandra chinensis.
Spiraea (most species and varieties).
Syringa—all species, and also the so-called French lilacs and other hybrids.
Viburnum Carlesii.
Weigela (most species and varieties).
Xolisma mariana.

Remarkable or Interesting Instances of Hardiness

Only the less frequently observed species are mentioned in this list. Commonly cultivated species which have not been mentioned in any of these lists may be assumed to have been found hardy.

Abies nobilis (older plants)—needles slightly burned.
Abies sutchuenensis. A. Faxoniana, A. recurvata (young plants).

Young plants of *Abies numidica* and *A. amabilis,* also *A. sibirica, A. sachalinensis, A. koreana, A. Pinsapo, A. lasiocarpa* and many others, perfect under lath shade.

Abeliophyllum distichum—in perfect condition on L. I.

Acer Buergerianum trinerve—only tips killed.
Acer creticum—only some tips and buds injured.
Acer Davidii—only tips injured.
Acer Henryi—only tips killed.
Acer macrophyllum only some tips injured.
Acer quinquelobum—only some buds injured.
Acer cissifolium—only some tips injured.

All are young plants.

Acer glabrum, A. insigne, A. Opalus, A. Sieboldianum, A. triflorum, A. cappadocicum, A. parviflorum—in perfect condition.

Acer palmatum—old plants observed in many places showed no injury; young plants in nursery showed slight injury to tips.

Actinidia arguta and *A. polygama*—in perfect condition.

Aesculus turbinata—in perfect condition.

Akebia quinata—in perfect condition.

Alnus cordata and *A. subcordata*—only some tips injured. *A. firma, A. Matsumurae* and *A. tenuifolia*—in perfect condition.

Ampelopsis aconitifolia—in perfect condition, while *A. cordata* and *A. brevipedunculata Maximowiczii* show injury to tips and killing of some twigs.

Aristolochia durior (*A. Sipho*) in perfect condition.

Artemisia Abrotanum—only tips injured.

Betula utilis Prattii, B. japonica, B. Delavayi-Forrestii, etc.—in perfect condition.

Buddleia alternifolia—in perfect condition.

Buxus microphylla koreana—only some tips injured.

Calycanthus floridus, C. fertilis and *C. Mohrii*—only flower buds killed in some places.

Camellia Sasanqua -killed back to about 10 inches from the ground at B. T. A.

Camellia japonica—killed almost to the ground but not dead, except on L. I. where flower buds and many leaf buds were killed but twigs were uninjured.

Carpinus cordata and *japonica*—in perfect condition, while *C. laxiflora* showed slight injury to tips.

Caragana aurantiaca, C. ambigua, C. Boisii, C. Chamlagu, C. decorticans, C. densa, C. microphylla, C. pygmaea, C. sophoraefolia—in perfect condition.

Caragana brevispina—only slightly injured.

Carya Pecan—only some tips injured.

Ceanothus Fendleri only some tips injured.

Cedrus Deodara (young plants 3–4 ft. tall)—only needles injured in several localities.

Celtis Douglasii, C. sinensis, C. australis, C. Tournefortii and *C. Bungeana* —only some tips slightly injured.

Celtis caucasica and *C. reticulata* (all small, young plants)—one-year- and two-year-old wood killed.

Cercidiphyllum japonicum—in perfect condition.

Cercis Griffithii—killed to snow line but in rather wet, low place.

Cercis Siliquastrum—at B. T. A. less seriously injured than *C. chinensis.*

Chamaebatiaria Millefolium—in perfect condition in dry, well-drained, rather poor soil.

Chamaecyparis Lawsoniana and many of its varieties (even the golden-leaved varieties)—in perfect condition, except slight burning on south

side in some places. Only two sets of seedlings apparently of a more tender race (5 yr. old), were almost killed.

Chamaecyparis nootkatensis and three of its varieties—in perfect condition.

Chamaecyparis obtusa and 13 of its varieties—in perfect condition.

Chamaecyparis thyoides and three varieties—in perfect condition.

Chamaecyparis pisifera and 15 varieties, even the juvenile forms—in perfect condition.

Clematis Armandii—killed only to the snow line.

Clethra barbinervis and *C. acuminata*—in good condition.

Clethra Fargesii—only some tips injured (young plants).

Cornus macrophylla—older plants in perfect condition; only the tips of young plants slightly injured.

Cornus coreana, C. Hemsleyi, C. paucinervis and *C. poliophylla* young plants in perfect condition.

Corylus Vilmorinii, C. tibetica and *C. heterophylla*—in perfect condition.

Corylus Sieboldiana mandshurica—showed slight injury to tips.

Cotinus coggygria only slight injury to tips.

Crataegomespilus Dardari and *C. grandiflora* in perfect condition.

Crataegus cuneata, C. Azarolus, C. chlorosarca, C. tanacetifolia, C. altaica, C. pentagyna—in perfect condition.

Cunninghamia lanceolata—uninjured in sheltered places; more or less severely burned where exposed.

Cytisus praecox, C. albus, C. austriacus Heuffelii—in perfect condition.

Daphne Genkwa and *D. Giraldii*—all flower buds killed.

Daphne Laureola Phillipii -only some flower buds killed.

Davidia involucrata Vilmoriniana—plant 15 ft. tall, of flowering age, as well as young plants 2–3 ft. tall, in perfect condition.

Decumaria barbara—only slight injury to tips under light cover but otherwise not particularly favorable conditions.

Ephedra distachya and *E. sinica*—only slight injury to tips.

Ephedra major procera tips killed.

Eucommia ulmoides—old plants in perfect condition.

Euptelea polyandra (8 ft.) in perfect condition.

Evonymus fimbriata and *E. macroptera*—only tips injured.

Evonymus lanceifolia, E. semiexserta, E. phellomana, E. hians, E. oxyphylla and *E. sachalinensis*—in perfect condition.

Forestiera acuminata, E. neo-mexicana—in perfect condition.

Fothergilla major—in perfect condition.

Fraxinus longicuspis, F. chinensis, F. Ornus—in perfect condition.

Fraxinus anomala and *F. xanthoxyloides* only tips injured.

Fraxinus Paxiana (3 ft.) in almost perfect condition; only a few tips injured.

Fuchsia magellanica Riccartonii—without cover, killed to the ground but not dead.

Genista pilosa, G. germanica, G. ovata, G. sylvestris, G. cinerea and *G. tinctoria alpestris*—only tips injured.

Genista sagittalis—killed almost to the ground, even under very favorable conditions.

Genista aethnensis all young growth and stems 1½ ft. from the ground killed in not very favorable place.

Gleditsia texana, G. caspica, G. horrida—in perfect condition.

Gleditsia macracantha only tips injured.

Gordonia Alatamaha—only utmost tips injured (young and old plants in different localities).

Gutierrezia Sarothrae—killed to the snow line in unfavorable place.

Halimodendron Halodendron in perfect condition.

Hymenanthera crassifolia—killed to the snow line only (in somewhat moist nursery).

Hypericum aureum, H. galioides, etc.—in perfect condition.
Hydrangea xanthoneura, H. petiolaris, H. heteromalla, H. cinerea and *H. arborescens*—in perfect condition.
Hydrangea Sargentiana—tips killed only (plants were protected but growing in moist nursery).
Ilex opaca and *I. glabra*—uninjured.
Jasminum fruticans—tips killed and much dead wood left but plants not seriously injured.
Jasminum Giraldi—uninjured without protection on L. I.
Juglans regia, var. *sinensis* (seedlings 4 ft.)—in perfect condition.
Juniperus communis hibernica -in perfect condition even in exposed places.
Juniperus rigida, J. formosana, J. scopulorum, J. conferta (large plants)—in perfect condition.
Kadsura japonica leaves killed but twigs apparently uninjured (L. I.).
Kolkwitzia amabilis—in perfect condition.
Laburnum alpinum, L. anagyroides and *L. Watereri*—in perfect condition.
Laburnocytisus Adami (6 ft.)—slightly injured on tips.
Larix occidentalis (5 ft.), *L. dahurica, L. Gmelini,* and var. *Principis-Rupprechtii*—in perfect condition.
Lavandula spica—uninjured both at B. T. A. and N. Y. B. G.
Leitneria floridana—in perfect condition.
Leucothoë Catesbaei—in perfect condition in most places; slight injury to leaves in some places.
Liquidambar formosana (15 ft.)—one-year-old wood injured only.
Lonicera, 45 species and varieties—in perfect condition.
Maclura pomifera—tall trees at N. Y. B. G. in perfect condition; on young plants (6 ft.) many tips and some branches were killed.
Magnolia acuminata, M. cordata, M. Kobus, M. liliiflora, M. parviflora, M. Soulangeana, M. stellata, M. tripetala, M. virginiana—in perfect condition except flower buds (see special lists).
Magnolia macrophylla most leaves killed but twigs and buds uninjured in sheltered place.
Mahonia Fremonti—only leaves partly burned.
Mahonia nervosa (small plants)—in perfect condition.
Malus yunnanensis Veitchii and 35 other species and varieties—in perfect condition.
Meratia praecox—only tips injured and some shoots killed (not more seriously injured than in previous milder winters).
Mespilus germanica—in perfect condition.
Morus microphylla—only tips injured. (*Morus alba* and *M. nigra* in perfect condition).
Nandina domestica in perfect condition on L. I. (no covering).
Pachistima Canbyi—in perfect condition.
Paeonia suffruticosa (young plants only ½ ft. tall)—in perfect condition.
Periploca graeca and *P. sepium*—in perfect condition.
Petteria ramentacea -only tips injured.
Philadelphus—of 32 species and varieties, including the New Mexican *P. argyrocalyx,* and the Asiatic *P. Magdalenae* and *P. incanus,* only *P. Delavayi* and *P gloriosus* and most varieties of *P. purpureo-maculatus* were killed to the ground in some places. *P. insignis* lost most of the one-year-old wood. Even *P. Lemoinei Manteau d'Hermine,* which has usually been injured in milder winters, shows no damage.
Picea asperata, P. Wilsonii, P. purpurea, P. complanata, P. Balfouriana, P. brachytyla, P. heterolepis, P. Koyamai, P. Schrenkiana, P. Breweriana, P. Glehnii, P. jezoensis, var. *hondoensis, P. Meyeri, P. montigena, P. polita, P. Smithiana* (1–6 ft.)—in perfect condition.
Picea sitchensis and *P. rubra* under lath shade, entirely uninjured; more or less severely burned where not shaded.

Picrasma quassioides (10 ft.) in perfect condition on sheltered slope in B. B. G.
Pinus aristata and *P. Balfouriana*—in perfect condition.
Pinus Lambertiana (small, 2 ft.)—needles partly burned and tips slightly but not seriously injured.
Pinus cembroides monophylla—small plants uninjured.
Pinus Sabiniana—older plant (15 ft.) in dry, gravelly soil at N. Y. B. G., only needles partly burned, no other injury. Small plants in moist nursery severely, perhaps fatally, injured.
Populus lasiocarpa—young plant (3 ft.), no protection given, in perfect condition.
Prunus Jacquemontii, P sibirica and *P. brigantiaca*—only some tips injured.
Prunus Armeniaca—only some tips injured.
Prunus Cocomilio—perfect. *P. subcordata, P. incana, P. Fenzliana*—tips killed and much dead wood (older plants in rather wet place).
Prunus Laurocerasus schipkaensis compacta—many leaves killed but twigs uninjured.
Pseudolarix Kaempferi—in perfect condition.
Pterocarya rhoifolia—only tips injured.
Pterostyrax hispida—old plants in perfect shape. Young plants showed injury to the tips of the twigs.
Pyrus nivalis, P. salicifolia, P amygdaliformis persica—some tips injured.
Quercus Cerris in perfect shape, young as well as old plants.
Quercus Cerris Ambrozzyana (4 ft., grafted on *Q. Robur*)—leaves killed. but plant in perfect condition.
Quercus Gambelii (6 ft.)—in perfect condition
Quercus hispanica, var. *crispa* and var. *Lucombeana* (5 ft., grafted on *Q. Robur*)—leaves killed but otherwise only some tips slightly injured.
Quercus Haas (5 ft.) and *Q. pontica* (small plant)—in perfect condition.
Quercus Libani—only tips injured in well-drained, poor soil. Young twigs killed in richer, moister soil (young plants 2–3 ft.).
Quercus undulata (4 ft.)—only some tips injured.
Quercus Toza (young plants, 3 ft.)— in perfect condition.
Rhamnus Pallasii, R. infectoria, R. Erythroxylon, R. caroliniana, R. spathulaefolia, R. utilis, and others—in perfect condition.
Rhus Potanini, R. javanica—in perfect condition.
Ribes burejense, R. Diacantha, R. rotundifolium, R. Gordonianum, R. aureum, R. leptanthum, R. petraeum, R. niveum—in perfect condition.
Rosa saturata, R. sertata, R. centifolia, R. mollis pomifera, R. gallica, R. caudata, R. Willmottiae, R Hugonis, R bella, R. Vorbergii, R. Bruanti (Mme. George Bruant), *R. multiflora cathayensis, R Paulii* (*rugosa* x *arvensis*), etc.—in perfect condition. The *rugosa* hybrid "Julien Potin" was quite seriously injured.
Ruscus aculeatus (6-inch plants)—at base of south-facing wall without covering, on L. I., uninjured.
Sarcococca Hookeriana—in perfect condition in somewhat moist place, shaded by other shrubs.
Schizophragma hydrangeoides—in perfect condition.
Sciadopitys verticillata -lost some needles but otherwise in perfect condition.
Sinowilsonia Henryi (young plant, 4 ft.)—only some tips injured.
Skimmia japonica—only outer leaves and tips of twigs killed (shaded).
Smilax Sieboldi—in perfect condition.
Sorbus hupehensis, S. scalaris, S. Conradinae, S. Folgneri, S. umbellata, S. aria, S. alnifolia, S. Matsumurana, S. pohuashanensis, S. discolor and many others—in perfect condition. Only *S. Wilsonii* is injured on the tips. *S. Vilmorinii*—killed to the ground.

Spiraea tosaensis, S. Blumei, S. crenata and most others—in perfect condition. Only *S. japonica* and its hybrids and a few others were more or less injured.
Staphylea holocarpa (4 ft.)—only some tips injured.
Stewartia Pseudo-camellia and *S. pentagyna*—only some tips on young plants injured.
Styrax Obassia in perfect condition.
Symphoricarpos oreophilus, S. utahensis, S. vaccinioides—in perfect condition.
Syringa microphylla, S. Potanini, S. pinetorum, S. Meyeri, and others—in perfect condition.
Taxodium ascendens (trees 20 ft. tall in N. Y. B. G. in rather dry place)—only a few young twigs injured.
Thuja orientalis and six of its varieties – only slightly injured by burning on south side in some places. Some of the juvenile forms, however, were quite seriously injured.
Thuja koraiensis and *T. Standishii*—in perfect condition.
Thuja plicata and several of its varieties in perfect condition (only two sets of seedling plants, five years old, apparently of a more tender race, were almost killed).
Thujopsis dolabrata—burned partly, but not severely injured.
Thymus transsylvanicus, T. zygioides, T. Serpyllum, and various others—only slightly injured.
Thymus hyemalis, T. Serpyllum citriodorus variegatus—killed to the ground but not dead.
Tilia Maximowicziana—perfect. *T. kiusiana*—only some tips injured (young plants in nursery).
Tripterygium Regelii—in perfect condition.
Tsuga Sieboldii—in perfect condition, while *T. Mertensiana* and *T. heterophylla* have been severely injured.
Ulmus alata (young and old trees)— in perfect condition.
Ulmus parvifolia (6–8 ft.)—in perfect condition.
Vaccinium stamineum—in perfect condition.
Viburnum buddleifolium, V erubescens, V fragrans, V. furcatum, V. lobophyllum, V. ovatifolium, V. shensianum, V. Veitchii—in perfect condition.
Viburnum rhytidophyllum, V. betulifolium, V. urceolatum, V. ellipticum, V. Carlesii in perfect condition.
Weigela—of a rather extensive collection of hybrid forms, only the following showed more or less severe injuries: Fraicheur, venosa, Waterer's Ruby, Descartes. Most of the others were in perfect condition.
Xanthoceras sorbifolia—in perfect condition.

Where the Winter was Helpful

Rock Garden Plants and most other perennials seem to have rather enjoyed this winter, with its long-lasting snow cover and the absence of dangerously warm spells in midwinter. They are generally in better shape this spring than after previous milder winters. The same applies to the bulbous plants; even *Crinum longiflorum* has wintered without injury—also all the *Eremurus, Lycoris squamigera, Oxalis adenophylla,* etc. Even *Saxifraga sar-*

mentosa, in the shelter of rocks, but without covering, wintered without injury.

The cool, moist spring, which, fortunately, usually follows a severe winter, gave many plants a chance to recover. Had a warm and dry spring followed serious winter injury, they would undoubtedly have died.

HENRY TEUSCHER, *Dendrologist,*
The New York Botanical Garden.

NOTES, NEWS, AND COMMENT

Since several infestations of gypsy moth have been found this summer in the Bronx, The New York Botanical Garden, through Dr. B. O. Dodge, Plant Pathologist, is now coöperating with L. L. Allen of the Park Department and H. L. McIntyre, who is in charge of pest control for the conservation commission at Albany, in an effort to locate and eradicate this pest.

Known as one of the worst of the leaf-eaters, the caterpillars of the gypsy moth will strip a tree bare in a short time. The pest, however, can be controlled if new infestations are found and treated immediately. It has previously been confined chiefly to the New England states and was apparently brought into New York on some plants which were harboring eggs. The caterpillar is one of the spiny-hairy sort with a flat head, and is readily identified by the pairs of dots along its back, red near the tail and grayish blue near its head. Anyone seeing such a caterpillar is asked to notify the Botanical Garden at once.

Twenty traps for Japanese beetles have been lent to the Botanical Garden by the United States Government, for the purpose of catching these pests as they enter the grounds. So far, while Japanese beetles have been numerous in the vicinity of Bronx Park, they have caused little trouble within the Garden itself. Baited with geraniol to attract the beetles, the traps are being set up near the rose garden.

Director E. D. Merrill has recently served as a member of the Committee of Selection for Latin America of the John Simon Guggenheim Memorial Foundation. Five graduate students and professors, two from Mexico and one each from Argentina, Chile, and Cuba, were selected to carry on researches in universities and museums in the United States.

In connection with the last commencement exercises of Columbia University, the degree of Doctor of Philosophy was granted to Miss Alice Aronescu, Mr. Edmund H. Fulling, and Mr. Harold N. Moldenke, all of whom have prosecuted their major research work at The New York Botanical Garden.

Dr. E. D. Merrill, Dr. H. A. Gleason, Dr. Fred J. Seaver, and Dr. E. H. Fulling represented the Garden at the summer meeting of the Botanical Society of America at Toronto, June 18 to 20. Dr. Merrill is president of the society. The chief feature of the meeting was a trip to the Bruce Peninsula, lying between Georgian Bay and Lake Huron. This region is comparatively little known from a botanical standpoint and harbors a number of species of considerable interest. Among these is a colony of the rare hart's-tongue fern, *Scolopendrium vulgare*. At the close of the meeting, the party was invited by President W. S. Fox, of the University of Western Ontario, to inspect other parts of the Bruce Peninsula and an interesting region along the shore of Lake Huron near Great Bend, which marks the northern limit of several species of southern trees and shrubs. At Toronto they also inspected a tract of ground which has been selected as the site of the proposed botanical garden of the University of Toronto.

Dr. L. Van der Pijl addressed a conference of the staff and registered students of the Garden May 25 on flower biology, with special reference to the flora of Java.

The following visiting botanists registered in the library during the spring: Dr. Glenn Gardner Hahn and J. R. Hansbrough, New Haven, Conn.; Prof. L. H. Bailey and Prof. H. H. Whetzel, Ithaca, N. Y.; Dr. Clement G. Bowers, Maine, N. Y.; Mr. G. L. Stebbins, Hamilton, N. Y.; Dr. Francis W. Pennell and Prof. Edgar T. Wherry, Philadelphia, Pa.; Prof. Geo. L. Zundell, State College, Pa.; Mr. R. Kent Beattie and Dr. Walter T. Swingle, Washington, D. C.; Mr. and Mrs. L. B. Linn, Crawfordsville, Ind.; Mrs. Inez Mexia, Berkeley, Calif.; Prof. George Haley, San Francisco, Cal.; Sir Frederick and Lady Phyllis Moore, Dublin, Ire.; Dr. L. Van der Pijl, Bandoeng, Java; and Prof. Y. Yamamoto, Taiwan, Japan.

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Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, tulips, lilacs, irises, peonies, roses, lilies, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 43,400 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above fea-tures and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
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Contributions to the Garden may be deducted from taxable incomes.

The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be sent to

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JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

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1859-1934
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NATHANIEL LORD BRITTON
January 15, 1859–June 25, 1934
(Photograph by Underwood and Underwood, July, 1907)

JOURNAL
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NATHANIEL LORD BRITTON

1859–1934

(WITH PORTRAIT)

Opportunity and the man conjoined to make the career of Nathaniel Lord Britton a notable one. The City of New York, spacious and wealthy, was a fitting site for an institution to be devoted to the study of the plant sciences and to the public display of plants and plant products of scientific, economic, and horticultural interest. Doctor Britton was the man of vision, energy, and resource, who, above all others, made the dream of a few a living reality. In a very large measure, it was his driving vitalizing force that, within less than thirty-five years, converted raw materials into The New York Botanical Garden, one of the leading institutions of its kind in the world.

Nathaniel Lord Britton was born at New Dorp, Staten Island, on January 15, 1859, and died at his home, 2965 Decatur Avenue, New York, January 25, 1934, being thus in his 76th year. He was the son of [Jasper] Alexander Hamilton Britton and Harriet Lord Turner. The family name suggests a connection with British soil, but it had its deeper roots in Bretagne or Brittany in northwestern France. Schrank's Malvaceous genus *Lebretonia* is believed to commemorate a botanically minded member of the family in a previous century. The first of the American line appears to have been James Britton, who came from London in 1635. A later representative of the line, Nathaniel by name, and his wife, Elizabeth, in 1695 acquired title to the Obadiah Holmes property in New Dorp, Staten Island, and in 1925 the Nathaniel of this sketch and

his wife, Elizabeth Gertrude, deeded a part of this land, with the old "Britton Cottage," to the Staten Island Institute of Arts and Sciences, in the hope that the old house would "long be preserved as an illustration of early colonial construction."

According to the available photographs, Nathaniel Lord Britton was a very boyish-looking youth, when, in 1879, at the age of twenty years and a little less than five months, the trustees of Columbia College conferred upon him the degree of Engineer of Mines. There was in those years no formal instruction in botany in Columbia College or its School of Mines. However, Dr. John Strong Newberry, the Professor of Geology and Mineralogy, was an "all-round naturalist of the old school," who had published a few papers on living plants and many on fossil ones. He had encouraged young Britton's botanical interests, which had been fostered by early association with Mr. John J. Crooke, on Staten Island. Crooke was a graduate of Yale, primarily a chemist and physicist, who made large collections of shells, birds, minerals, and plants. On Mr. Crooke's death in 1911, Doctor Britton wrote that he had been favored with his "intimate acquaintance since boyhood and his [Britton's] direction to lines of scientific inquiry was induced by this companionship and suggestion."[1] It is said that even as a child the young Nathaniel, when taken on drives, knew the names of roadside trees and other plants in a way that seemed very mysterious to his parents. In those early years on Staten Island, association with the slightly older Arthur Hollick, his classmate in the School of Mines, was also a factor in shaping the development of the future botanist. In company with Hollick, he joined the Torrey Botanical Club in October, 1877. Hollick and Britton's "The Flora of Richmond County, New York" was published in 1879, the year of their graduation. Britton's first appearance in botanical literature had been somewhat earlier—in the *Bulletin of the Torrey Botanical Club* for October, 1877, under the title "Staten Island Plants." After miscellaneous notes on the local occurrence of various species, he observes that on dropping open-flowered plants of *Opuntia vulgaris* (?) the radiately extended anthers are by the shock (or by a slight tap, even when not dropped) drawn in against the stigmas, afterwards, when left quiet,

[1] Journal of The New York Botanical Garden **12**: 161. 1911.

resuming their extended positions. This simple observation on the prickly pear was a forerunner of the sumptuous four-volume Britton and Rose monograph of "The Cactaceae" of the world! However, the implications are physiologic rather than taxonomic. His second, third, and fifth contributions, all published in the *Bulletin* while still an undergraduate in the School of Mines, have physiologic or phaenologic rather than systematic bearings. The second is entitled "When the Leaves Fall." It includes a table of 65 species of trees, shrubs, and vines, with notes as to the condition of the leaves on five dates in October and November, 1877. He observes that "the female in dioecious plants appears to hold its foliage longer than the male * * * -very strongly marked in *Ailanthus glandulosus*, *Acer saccharinum* and *A. rubrum*, and *Salix alba* and *S. discolor*, but not in *Populus*." A companion piece, a few months later, is "When the Leaves Appear." Another brief paper, just before his graduation, bears the title "Notes on the Relative Age and Dimensions of a Number of Different Trees."

On his graduation from the School of Mines, in 1879, he became Assistant in Geology under Professor Newberry and for the five following years he was also Botanist and Assistant Geologist of the Geological Survey of New Jersey. In 1881 he published "A Preliminary Catalogue of the Flora of New Jersey" and this apparently served as his thesis for the degree of Doctor of Philosophy, which was conferred upon him in that year by Columbia College. A revised and enlarged edition of this Catalogue appeared in 1890.

On August 27, 1885, Doctor Britton married Elizabeth Gertrude Knight, daughter of James and Sophie Anne (Compton) Knight, who was not only a constant helper in all his subsequent undertakings, but also achieved individual fame as a bryologist and plant conservationist.[2] Her recent illness and death appeared to be a shock from which he never recovered. The last time that he left his rooms alive was on February 27 to lay his life companion to rest in the old Moravian Cemetery on Staten Island. Just four months later, to a day, others performed for him the same sad service.

The years following Doctor Britton's marriage were, like essentially all of his years, characterized by ceaseless mental activity. In addition to teaching, he found time for numerous obser-

[2] Journal of The New York Botanical Garden **35**: 97–104. 1934.

vations on the higher plants, most of which were published in the *Bulletin of the Torrey Botanical Club,* of which he was editor from 1888 to 1898. In 1886 his title in Columbia College was changed to Instructor in Geology and Botany and in 1891 to Adjunct Professor of Botany. During all of this time he was laying the foundations in fact, if not with full intent, for the Britton and Brown, "Illustrated Flora of the Northern United States and Canada," which came out in three volumes, 1896–98. Illustrated floras had appeared in Europe, but this was the first sustained attempt in the United States to describe its plants with a text illustration of the characteristic features of each species. The work was a popular success and now, thirty-six years after the publication of the third volume, when it is of necessity somewhat outmoded, the work still remains a good seller. It has played a great part in popularizing the study of plants in the United States and Canada, as has also its non-pictorial one-volume successor, Britton's "Manual of the Flora of the Northern States and Canada."

Doctor Britton himself is authority for the statement that the beginnings of the history of The New York Botanical Garden may be traced to a remark made to him by Mrs. Britton in the summer of 1888, when they were on a visit to the Royal Botanic Gardens at Kew, England. Mrs. Britton, impressed by the beauty and scientific interest of the plant exhibits at Kew and by the importance of the Royal Gardens' numerous contributions to the literature of the plant sciences, said, in effect: "Why couldn't we have something of this kind in New York?" At a meeting of the Torrey Botanical Club held on October 24, 1888, Mrs. Britton gave a description of the Royal Gardens at Kew. At the next meeting of the Club, a committee was appointed, consisting of E. E. Sterns, Arthur Hollick, Thomas Hogg, H. H. Rusby, T. F. Allen, N. L. Britton, J. S. Newberry, and Addison Brown, to consider the idea of establishing a botanical garden in the City of New York. At a meeting of the Club on January 8, 1889, an appeal for such a garden, prepared by the committee, was adopted and ordered printed. The consent of the Department of Public Parks was secured for the establishment of the proposed garden if sufficient means for its maintenance could be obtained. An Act of the Legislature of the State of New York, drawn by Judge Charles P. Daly and Judge Addison Brown, became a law when signed by Gover-

nor Hill on April 28, 1891. This established a corporation known as "The New York Botanical Garden"

"for the purpose of establishing and maintaining a botanical garden and museum and arboretum therein, for the collection and culture of plants, flowers, shrubs, and trees, the advancement of botanical science and knowledge, and the prosecution of original researches therein and in kindred subjects, for affording instruction in the same, for the prosecution and exhibition of ornamental and decorative horticulture and gardening, and for the entertainment, recreation, and instruction of the people."

The list of incorporators included forty-eight names of New Yorkers of distinction. Besides the botanists Addison Brown and Nathaniel L. Britton, there were such well-known names as Seth Low, Charles A. Dana, Henry C. Potter, Cornelius Vanderbilt, Morris K. Jesup, J. Pierpont Morgan, Andrew Carnegie, D. O. Mills, William C. Schermerhorn, John S. Kennedy, David Lydig, Samuel Sloan, and William E. Dodge. The Act of Incorporation authorized and directed the Park Commissioners to set aside for the proposed Garden not exceeding 250 acres in Bronx Park or some other public park north of the Harlem River, if, within seven years, the corporation should secure by subscription not less than $250,000 "for successfully establishing and prosecuting the objects aforesaid." The first subscription, of $25,000, was made by Judge Addison Brown, and was followed by a subscription of an equal amount by Columbia College.[3] By June 18, 1895, the required $250,000 had been raised by subscription, the Commissioners of Public Parks were asked to set aside 250 acres of land in Bronx Park, and the Board of Estimate was requested to appropriate $500,000 for the erection of suitable buildings, as had been made mandatory by the act of the state legislature. A Board of Managers had already been elected, with Cornelius Vanderbilt, President; Andrew Carnegie, Vice-president; J. Pierpont Morgan, Treasurer; and N. L. Britton, Secretary. Seth Low, President of Columbia University, accepted the chairmanship of the Scientific Directors.

[3] Columbia, aside from her broad interests in education and research, had a sentimental interest in botanic gardens from the fact that the twenty acres occupied by the Elgin Botanic Garden of Dr. David Hosack -the present site of the Rockefeller Center—was donated to Columbia College by the State of New York in 1814 and has long constituted one of the chief sources of revenue of Columbia College and the subsequent Columbia University.

A little later an agreement was entered into with Columbia College whereby the herbarium and botanical library of the College were to be deposited at the Garden and the facilities of the Garden were to be placed at the disposal of teachers and advanced students of botany in the College. On June 17, 1896, Doctor Britton was elected Director-in-Chief. He immediately resigned his Columbia professorship and was made Professor Emeritus at the early age of thirty-seven years. The site of the new Garden, consisting of 250 acres in the northern part of Bronx Park, was approved by the Park Commissioners in July, 1895, and more than 140 acres were added to this in 1915, making the total area of the Garden nearly 400 acres. By agreement with the City certain restrictions were imposed upon making changes in the "Hemlock Grove" bordering the Bronx River. The development and planting of the remaining area occupied the attention of Director Britton and his assistants for the next thirty-three years. The training in engineering received by him while a student in the School of Mines was often put to practical use in laying out the grounds. But the physical plant of The New York Botanical Garden was never more than a means to an end with Director Britton. His first thought was always for scientific research and the publication of its results. In the autumn of 1900 he spent seven weeks abroad, attending the International Congress of Botanists held in conjunction with the Paris Exposition, and visiting some of the larger botanical gardens and herbaria of France, Switzerland, Germany, and England, arranging exchanges of herbarium specimens, books, seeds, and living plants and studying methods of culture and display of plants. One of the general conclusions drawn from this European visit was the following:

"As to the general features of the foreign institutions as compared with our own, I would report that the botanical gardens and museums of Berlin, London, and Paris are naturally far in advance of us at present, in the number of species in cultivation and in the size of their herbaria, libraries, and museum collections, and in the development of the grounds. But as regards site, soil, natural topography and buildings, none of them compare with Bronx Park at all favorably."

Botanical exploration of the West Indian region, which was to become such an important feature of the Garden's activities during

its first third of a century, was begun by an expedition to Porto Rico by Mr. and Mrs. A. A. Heller in 1898, financed by Cornelius Vanderbilt. Dr. Britton's first personal participation in this West Indian exploration was in 1901, when, in company with Dr. John F. Cowell, Director of the Buffalo Botanic Garden, he spent a few weeks on St. Kitt's (St. Christopher's) of the Leeward Islands group. A paragraph in his report foreshadows the general policy of the Garden in its field work during many succeeding years:

"The personal reconnaissance of the West Indian flora, taken together with other considerations, has convinced me that our exploration work for a series of years had best be mainly done in the West Indies and Central America. It is certain that this course would bring to light a very large number of species new to science, and the specimens illustrating them, as well as other species of rarity, would greatly enrich our collections in all departments. It would render more complete our work on the systematic botany of North America, and would tend to make the plants of tropical America more accurately known, and thus have an important bearing upon the increasing commercial relations of the United States with the countries to the south of our present domain. I hope to present, in the near future, a plan for this proposed system of exploration."

Dr. Britton himself participated personally in no less than thirty botanical visits to the West Indies, mostly at his own expense.

In 1901, a plan for the publication of the "North American Flora" was adopted and its preparation referred to Professors L. M. Underwood and N. L. Britton. The work was to be complete in thirty volumes (afterwards extended to thirty-four) and "North America" was to be interpreted liberally, to include Greenland to the north and the Republic of Panama and the West Indies on the south. The coöperation of prominent botanists outside of the Garden staff was assured, but the magnitude of the task and other activities of the leading contributors have operated to slow down publication to a greater degree than was anticipated by the original promoters of the ambitious enterprise. At the present time, twenty-nine years after the appearance of the first part, seventy-four parts have been published and only one volume of the proposed thirty-four is complete. It is hoped that ways may be found to bring this great undertaking to a reasonably early completion.

Dr. Britton was one of the prime movers in the framing of the so called "Rochester" and "American" codes of botanical nomenclature, which emphasized the priority principle in the selection of the valid Latin names for genera and species of plants. The adoption of these principles by Britton in the "Illustrated Flora," the "Manual," etc.; by Small in his "Flora of the Southeastern United States"; by Rydberg in his "Flora of the Rocky Mountains"; and by various other contributors to the literature of systematic botany, led to a wide use of names that, in many cases, were different from those that had been made familiar by the earlier American manuals. Attempts to have the "American Code" adopted in its essential entirety by all of the botanical world have failed, yet many of its distinctive features are recognizable in the latest revision of the "International Rules of Botanical Nomenclature." Much of the diversity in nomenclature that still persists is due to differing ideas as to generic and specific limits. Genera and species being essentially subjective concepts rather than objective realities, their material content does not seem to be subject to successful legislation by botanical congresses.

In his limitation of species, Doctor Britton was, on the whole, rather "conservative," but in defining genera his tendency to "split" rather than to "lump" is perhaps especially notable in the handsome Britton and Rose four-volume work on "The Cactaceae" published by the Carnegie Institution of Washington in 1919–23. Britton and Rose recognize 124 genera and about 1,237 species. A third of a century earlier, Dr. K. Schumann, in his treatment of the Cactaceae in Engler and Prantl, "Die natürlichen Pflanzenfamilien" recognized 20 genera and about 775 species. While the increase of genera from 20 to 124 was largely of the "splitting" or "segregating" type, in conformity with the general trend of biological practice, it is an indisputable fact that Britton and Rose had at their disposal vastly more material than was available to any of their predecessors, and the increase in the number of recognized species from 775 to 1,237 represented a notable advance in actual knowledge of the living forms exhibited by the Cactus Family. This elaborate monograph doubtless represents the climax of Doctor Britton's contributions to scientific literature. It has established a new datum line from which future investigations of the Cactaceae must proceed. In a letter received at The New

York Botanical Garden since the death of Doctor Britton, a well known Japanese botanical author has written:

"It is my ardent intention to translate this masterpiece into Japanese and to publish it in the near future for the many botanists, gardeners, Britton devotees, and others to be found among my fellow-countrymen, who would consider the work a boon."

Especially noteworthy among Doctor Britton's later publications are the "Flora of Bermuda" (1918), "The Bahama Flora" (1920, with C. F. Millspaugh), and the "Botany of Porto Rico and the Virgin Islands (Spermatophyta)" (two volumes, 1923 1930, with Percy Wilson), all representing great advances over any previous works in the same field.

Doctor Britton was always recognized as the moving spirit in organizing the "Scientific Survey of Porto Rico and the Virgin Islands" under the direction of a committee of the New York Academy of Sciences, with the coöperation of The American Museum of Natural History, The New York Botanical Garden, and some of the scientific departments of Columbia University and other institutions. The Government of Porto Rico has assisted the enterprise by substantial appropriations of money and the two agricultural experiment stations, one at Mayagüez and the other at Rio Piedras, have coöperated. Up to the present date, five of the projected eighteen volumes of the reports of this Scientific Survey, together with eighteen parts of other volumes, have been published. While the members of this Survey committee will feel that they have sustained an almost crushing loss in the passing of their constructive leader, it seems probable that the momentum already given to the project by him will suffice to carry it through to essential completion. Nothing comparable has ever been published for any other West Indian islands. Doctor and Mrs. Britton had spent many winters in Porto Rico, and they were held in high esteem there. Several messages of sympathy were sent from the island to Director Merrill, when the news of Doctor Britton's death was received. Besides radiograms from Acting Governor Horton and others, J. A. B. Nolla, Acting Commissioner of Agriculture and Commerce, radioed:

"News of death of beloved Dr. Britton a shock to his host of Porto Rican friends. Please convey to his associates and relatives condolences Department of Agriculture Porto Rico and my own."

The Committee on Mineral Resources sent the following:

"Porto Rico loses a great friend in the death of Doctor Britton, President. Please convey heartfelt regret to his family and the staff of the Garden."

According to a list compiled by Mr. Percy Wilson, five genera of plants and one of animals have been named in honor of Doctor Britton and one of mosses in honor of Mrs. Britton. These are:

BRITTONAMRA Kuntze, of the Pea Family, with 1 species, a native of tropical America.
BRITTONASTRUM Briquet, of the Mint Family, with 15 species, natives of Mexico and the western United States.
BRITTONELLA Rusby, of the Malpighia Family, 1 species, native of Bolivia.
BRITTONELLA Fisher, a genus of beetles, 1 species, native of Porto Rico.

In naming this genus, Dr. Fisher remarked:

"I take great pleasure in dedicating this genus to Dr. N. L. Britton, director for more than three decades of The New York Botanical Garden, chairman of the Porto Rico Committee of the New York Academy of Sciences, to whose able and indefatigable services is due in large part the success of the Natural History Survey of Porto Rico."

BRITTONROSEA Spegazzini, of the Cactus Family, 21 species, natives of South America.
BRYOBRITTONIA, of the mosses, 1 species, native of Yukon Territory.
NEOBRITTONIA Hoclreutiner, of the Mallow Family, 1 species, native of Mexico.

Sixty-nine species and varieties of plants, living and fossil, and three of animals have been dedicated to Doctor Britton, while fifteen species of plants and one of animals have likewise been named for Mrs. Britton. In addition, two species of plants, a palm (*Copernicia Brittonorum* León) and a beard-tongue (*Penstemon Brittonorum* Pennell) appear to have been named for the two conjointly.

Brittonia, a periodical, issued at irregular intervals and devoted chiefly to papers on systematic botany, was established by The New

York Botanical Garden, at the suggestion of Doctor Britton's successor, Dr. E. D. Merrill, in 1930, the first number appearing in 1931.

Doctor Britton was honored with the presidency of the Botanical Society of America for the year 1897–98, and again, of the larger more democratic Society, for 1921, and he and Mrs. Britton were patrons of this Society. As he advanced in years, he developed a reluctance to traveling (unless on board a steamer headed southward) and also to making public addresses. When the time came for him to deliver an address as retiring President of the Botanical Society of American at Toronto in December, 1921, he sent a substitute, bearing his check for $1,000 drawn to the order of the Society, in lieu of a formal address!

With his friend Doctor Arthur Hollick, Doctor Britton was active in organizing and developing the Natural Science Association of Staten Island (now the Staten Island Institute of Arts and Sciences) and was its President, 1888–91. He was also actively interested in the Torrey Botanical Club and the New York Academy of Sciences, of which he was President for two years (1906 and 1907). In 1913, he was honored with the presidency of the New York State Forestry Association. Doctor Britton received the honorary degree of Doctor of Science from Columbia University in 1904 and the degree of Doctor of Laws from the University of Pittsburgh in 1924. He was a member of the National Academy of Sciences, the American Philosophical Society, the American Academy of Arts and Sciences, a foreign member of the Linnean Society of London, the Czechoslovakian Botanical Society, the National Medical Institute of Mexico, Honorary President of the International Desert Conservation League, the Cactus and Succulent Society of America, etc.

Doctor Britton was of slight and apparently frail physique. Many of his friends marveled that he could hold out and keep active until several months after the seventy-fifth anniversary of his birth. He retired from the directorship of the Botanical Garden on August 1, 1929, when in his seventy-first year. Many men would have been content then to rest upon their achievements, especially if their achievements had been as notable as his, but an indomitable urge and ingrained habit kept him busy with his studies of the Cyperaceae and of the flora of his beloved Porto Rico until within

a few months of the end. Doctor Britton was a man of simple habits of life and of modest demeanor. He was of a usually placid and cheerful temperament, which was notably manifest during the long weeks of suffering that preceded his death. He left a sister and a brother, Harriet Louise Britton and Richard H. Britton, both of Great Kills, Staten Island. Doctor and Mrs. Britton had no children. In a way that was very real to them, The New York Botanical Garden was their child.

During his directorship of thirty-three years—a short space of time as the world goes—Doctor Britton had seen The New York Botanical Garden develop from little more than an idea to a well-developed tract of nearly 400 acres, with handsome buildings, an herbarium of more than 1,700,000 specimens, and a library of 43,500 bound volumes. As many have remarked, The New York Botanical Garden is a living monument to Nathaniel Lord Britton. It is a noble monument—a monument worthy of the man!

MARSHALL A. HOWE.

DO CYCADS BRANCH?

In many text-books of botany and in floras one may find statements like, "Tropical plants, with an unbranched cylindrical trunk, increasing like palms by a single terminal bud; ——." Such phrases occur in descriptions of cycads. It is true that cycads, at least those with aerial erect stems, as we usually see them in cultivation, are simple-stemmed. Those with underground stems in cultivation we cannot vouch for one way or another.

Florida can boast of four species of the cycad *Zamia,* the commercial name for which is Florida-arrowroot. The popular names are coontie, conti, comptie, comfort-root, and wild sago.

Two paragraphs of information, the first from Commodore Ralph Munroe of Miami and the other from the late Mrs. Mary A. Noble of Inverness, are inserted here.

"As to cultivation of Coontie, think I am safe in stating that it never has been successfully done. It was about the first southern Florida production that I attempted to commercialize, but from all sources available at that time—1882—up to the present, have never

FIGURE 1. A single plant of *Zamia integrifolia* in the pine woods near Naranja, Fla. Fire had cleared hundreds of acres of the oölitic limestone on which the zamia grows. Many of the zamia plants, too succulent to burn, were thus made clearly visible.

heard of its being accomplished. I know that when Dr. Cutler and Mr. Fuzzard came from Boston in the eighties with quite extensive starch-making machinery, this question came up, when I told them that without reproduction of raw material on a sufficiently large scale their business would fail, and fail it did. Humorous old Jack Peacock, one of the first new settlers after the last Indian war, used to solemnly aver that 'comty' as he termed it, could never be grown by man unless the black-birds could be trained to plant the seeds."

* * * *

"Early in 1900 a factory in Lake Helen went into operation for the purpose of making starch from the root of *Zamia*. In the advertisements and circulars it was called "comptie," and was pronounced as spelled. Dr. Chapman gave it as "coontie," which sounds like an Indian name. The root was procured from several regions along the East Coast, but most of it came from near Miami, and was brought to Lake Helen in carloads. One of the early starch-makers in northern peninsular Florida correctly recorded that coontie plants were pistillate and staminate, and that the pistillate plants make a branched root (underground stem) with several tubers (branches) on the main stem, while the staminate plant usually has only one tuber. The bright red seeds, he records, will not germinate if planted, but must be just scattered on the ground."

These give some of the observations and superstitions connected with this plant, so unusual in our flora, except in parts of peninsular Florida, which is noted for its many other unusual plants and interesting floristics.

We must admit that cycads as we ordinarily know them, especially in cultivation, are simple-stemmed.

We have found three of the four Florida species to be branched, rather frequently. If cycads should have simple stems, Figure 1 shows how a zamia plant can go astray from the straight and narrow path. One species, however, (*Zamia angustifolia*) from the hammock islands in the southern end of the Everglades, as far as we have observed has simple stems. The reason for this will be shown on a following page.

The cycads of Florida grow in different regions and different habitats. Three of the four species are historic plants. They occur in regions of former aboriginal activity. The most widespread species is *Zamia integrifolia*. Its center of abundance is the Everglade Keys. It is a pineland plant. It is found in sporadic

FIGURE 4. On the refuse dump of a coontie mill near Miami. The zamia stems standing against a pine slab, show simple and branching conditions. The stem on the right showing four stout branches is upside down.

regions up through the peninsula to the Suwannee River region. It may have been carried to these regions distant from the southern tip of Florida by the aborigines who used the stems of the plant as a source of starch. The species second in abundance is *Zamia umbrosa*. It is confined to northeastern Florida and is a hammock plant. The third in abundance is *Zamia silvicola*. It is likewise a hammock plant, and also occurs on kitchen-middens. All three regions were centers of great aboriginal activity. The habitats of the plants of these three species have been fire-swept for ages. At the time these cycads invaded what is now peninsular Florida they may have been simple-stemmed, as many of the specimens are now.

We know from circumstantial evidence that forest fires in primeval times increased as time went on. We know that forest fire is one kind of irritation that will cause latent buds in plants, especially cycads and palms, to become active. Furthermore we find zamia plants most freely branched in the regions that have been most frequently fire-swept since primeval times, and this is in the order of species cited in a preceding paragraph. *Zamia angustifolia*, which as far as we know has unbranched stems, grows where fires are rare and has its stems buried so deep in wet humus that fire cannot reach them.

The plant shown in Figure 1 is in the pinelands of the Everglade Keys. At this point fire had swept the pineland clean several weeks before the picture was made. The leaves of the *Zamia* were burned off and the new leaves had just began to develop. The heat of the fire had caused the cones to wilt and two were just beginning to assume their proper upright position. Investigation showed that this plant had eleven cone-bearing branches. Simple and branching stems of *Zamia integrifolia* are shown in Figure 2.

If the stories about difficulty of increasing the supply of zamia through cultivation by seeds be true, fire has come to the rescue to the extent of increasing the supply by causing many of the stems to branch, thus making one seed produce the amount of starch that several of the unsprouted ones might have, had they grown.

Fire through the ages has been a Burbank, so to speak, for the benefit of the aboriginal red-man, the Seminole, and the white man down to the present generation.

JOHN K. SMALL.

DR. STOUT DOES HONOR TO THE DAYLILIES

Daylilies from the botanical, historical, and horticultural points of view are treated in thorough manner in an attractively illustrated book[1] which has recently come from the pen of Dr. A. B. Stout.

Using the large collection he has made of the genus *Hemerocallis* at The New York Botanical Garden as a background for his study, he has supplemented his observations with information from important growers in other parts of the world, and has combined all this knowledge in a volume of distinct horticultural value.

The new varieties of daylilies which may now be obtained—far different from the old-fashioned lemon and fulvous daylilies—open up splendid new possibilities for landscaped effects in the garden. For these new varieties, some fifteen of which are Dr. Stout's own creations, are larger, more floriferous, and, with their occasionally twisted petals and often sprightly tones of red, more decorative in form and color. In height, too, great diversity is offered, as shown in one striking picture in which photographs of six kinds are reproduced to the same scale, showing flower stalks varying from six inches to six feet.

In his hybridizations, which are noteworthy, Dr. Stout has sometimes used wild species heretofore unknown, which were especially imported from China and Japan for his use. These are now to be seen growing in the specimen planting of daylilies on the west side of the grounds of The New York Botanical Garden.

Dr. Stout's book, which describes every known variety and gives complete cultural directions for this brilliant, easy-to-grow flower, gives gardeners their first complete picture of the genus *Hemerocallis* and how it can be used to create new beauty spots in the garden.

CAROL H. WOODWARD.

[1] Stout, A. B. Daylilies: The wild species and garden clones, both old and new, of the genus Hemerocallis. Pp. i–x + 1–119. Pl. 1–36. The Macmillan Co., New York. 1934. $3.00.

CONTROLLING THE HOLLYHOCK RUST[1]

Now that the hollyhock season is over it is time to begin operations designed to control the rust disease that is so often prevalent in our flower gardens. This parasite is one of the simplest of the rust fungi. It is now known that the brown spores found in the rusty spots on the leaves and stems germinate just as soon as they are mature if provided with moisture. During germination the spots turn color from brown to ash gray. As many thousands of sporidia, each capable of initiating a new infection, are developed on the spots, one understands how it is that the leaves become so heavily infected and how difficult it is to prevent the spread of the infection once the rust has become established.

Since the rust appears early in the spring with the first leaves, one might suspect that the parasite overwinters in the roots or crown. A noted Scandinavian pathologist always claimed that the hollyhock rust is perennial in its host, appearing with the new growth in the spring. This claim has been thoroughly disproved, however. Every spot on a leaf is the result of a new and separate infection. Very late in the season the new crown leaves may become infected. This new infection may carry the fungus through the winter, as the plants are dormant.

The brown spores may also remain viable all winter and so infect the first spring leaves anew. In either case it shows how important it is to destroy all of the old infected plants, stems as well as leaves, after the blooming period. Otherwise, the infected parts bearing spores collect on the ground over the crowns and thus they either bring infection to the tips of the late fall crown leaves, so that the fungus goes into a dormant condition along with these leaf primordia, or the spores, living over winter, cause the early leaves to become infected.

It is often stated with some confidence by authors that the hollyhock rust can be controlled by dusting the plants with a fine grade of sulphur. Any one who has tried this after the infected plants have reached some height knows that such measures are not always successful. It requires only about twenty-four hours for the spores to germinate and penetrate the host tissues, and some six to ten days for new pustules to mature. New leaves are con-

[1] *Puccinia malvacearum.*

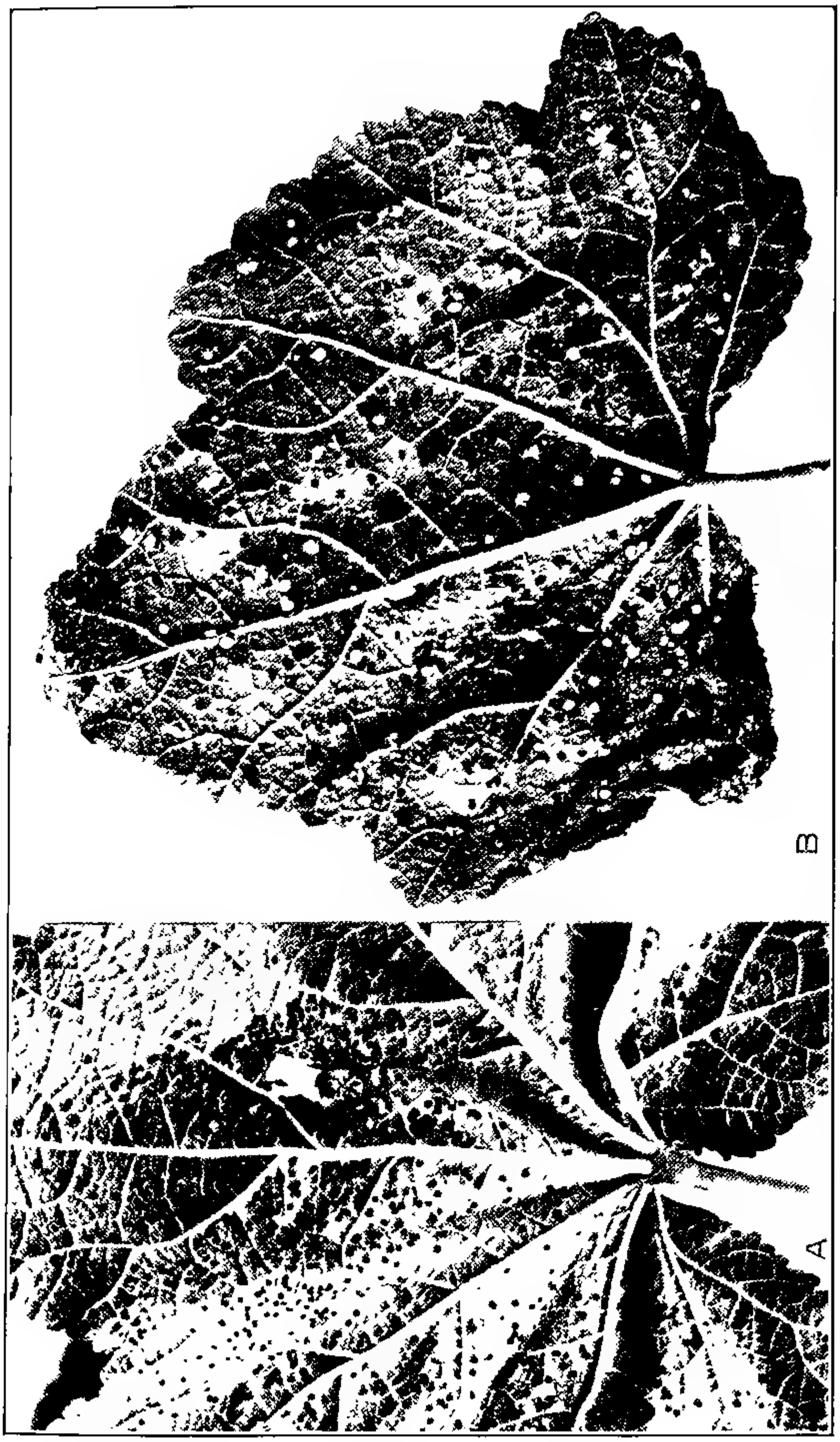

FIGURE 1. A. Hollyhock leaf so heavily infected on one area at the center that the leaf tissues were killed and pieces of the leaf were falling out. The leaf was taken during a period of very dry weather; the spores had not germinated. B. The dark spots represent rust pustules whose spores had not germinated. The white spots indicate that the spores in these pustules had germinated.

tinually unfolding and new rust pustules are continually breaking forth, so that unless one were to dust his plants every day, new infections are found to develop if there is sufficient moisture to induce the spores to germinate.

Some years ago the writer's attention was directed to a case of heavy infection of seedling hollyhocks that had been grown in flats in a cold-frame. The seedlings were about five or six inches high and heavily rusted. They were taken from the cold-frames and thoroughly dusted with Pomo-green, and, after they had been planted in the borders, the dust was applied two or three times a week until the plants had reached some size, with very satisfactory results. Just how the seedlings originally became infected is not clear. Probably rust pustules were carried over on fragments of the fruit scales or on pieces of leaves, and the infection spread to the young leaves in the moist cold-frames. The plants in our perennial borders were kept free from the rust for the two succeeding years with very little attention given them beyond a few applications of dust in the spring and the careful destruction of old plant parts. Last year, however, perhaps owing to the introduction of several new varieties, the rust appeared in epidemic form in plants about two feet high. In spite of repeated applications of sulphur dust, the rust persisted until the end of the season. A thorough clean-up of the old infected plants and a careful dusting this spring as the leaves appeared served to give us rust-free plants. There were only two plants out of a large number that showed any rust. These evidently had escaped notice until they were about a foot high, when it was found that practically every leaf was spotted with the rust. Infected leaves were removed and the plants were thoroughly dusted about twice a week. This did not prevent the rust from developing considerably on new leaves as they unfolded. It is clear from this that successful control measures must involve the prevention of the earliest infections. The removal of infected leaves is not sufficient, as rust pustules often develop on stems and a single pustule alone serves as a great source of trouble.

To control hollyhock rust: A. Destroy all plant parts after blossom time so that no infected material can come in contact with the new leaves developed in late summer and fall. B. Dust the young leaves the following spring with a good grade of dusting

sulphur as soon as they appear, in March or April. Repeat once a week until blossom time. The sulphur dust will also help to control the red spider mite.

B. O. Dodge.

DISTRIBUTION OF SEEDLING DAYLILIES

Early in July a notice was sent to all members of The New York Botanical Garden that seedling daylilies to the number of 1200 would be distributed and that as long as this supply lasted ten plants would be given to any member who called or sent for them. The response was such that 1400 plants were distributed.

These seedlings were grown in connection with the work of experimental breeding and were being discarded to make room for new seedlings. They are of value chiefly for use in naturalistic plantings at this time when plants of most of the named varieties of daylilies can not be supplied in quantity by nurserymen. Many of these seedlings surpass certain of the varieties that have been named for culture as garden plants; but they are not considered as good as the selection seedlings and it is not expected that any of them will be named and propagated for special culture in gardens.

Several hundred of the best seedlings in the cultures of daylilies have been selected for critical study and comparison, and for use in further breeding. The New York Botanical Garden is not able to propagate these choice seedlings either for sale or general distribution and this is being done by nurserymen. Already thirteen selection seedlings have been named as clonal varieties and described and illustrated in *Addisonia,* in the Journal of The New York Botanical Garden, or in other publications available to gardeners. Several are being offered to the trade in the catalogs of nurserymen. There are also many seedlings of special charm and merit and there are various distinctly new types, especially in dwarf plants and in plants with numerous small flowers, with bicolored flowers, and with a wide array of attractive red colors. Nearly all of these seedlings are complex hybrids that do not breed true from seeds. The individual seedlings of special merit must be multiplied by repeated division. This is being done by nurserymen as rapidly as possible.

A. B. Stout.

NEW BOOKS FOR AMATEUR GARDENERS AND NATURALISTS

Among the books which have recently been acquired by The New York Botanical Garden and placed on the library shelves for the reference of the public are the following new volumes, all published within the last few months:

A Picture Book for Gardeners[1]

A new type of gardening book has just been prepared by G. A. Stevens, who has apparently designed it to serve as a picture guide for that vast crop of amateurs that springs up every year.

It is like a glorified catalogue of flowers, in which one looks vainly for the dealer's name. The colors at times are garish, though no more so than one is accustomed to seeing in most of the seed catalogues.

Subjects are arranged alphabetically, from Abelia through Zinnia, with a preponderance of roses, lilies, and tulips. The index, a thorough one, is an aid to the perplexed reader who finds some flowers listed by their common, and some by their scientific name. Both names, however, are usually mentioned in the text, which in most cases gives brief cultural directions for the plants.

The illustrations are made and produced by the J. Horace McFarland Company.

All about Terraria[2]

The first volume to appear since glass gardens assumed a place of decorative importance in the home has been prepared by Mildred Norton Andrews. First telling what glass gardens are, she proceeds to explain the principles underlying their construction, tells how to make them, how to plant and care for them, and how to use them in an indoor decorative scheme. The book is well illustrated, and in the appendix is offered a judging scale for gardens in glass or for specimens in glass containers at flower shows.

[1] Stevens, G. A. Garden flowers in color. 320 pages, more than 450 illustrations in color. The Macmillan Co. New York. 1934. $3.75.

[2] Andrews, Mildred Norton. Gardens in glass. Pp. 120, illust. A. T. DeLaMare Co. New York. 1934. $1.50.

Cacti of the American Desert[3]

Designing their book especially for those travelers who, becoming fascinated by the grotesque forms of the plants they encounter in the American desert, long to learn their names, Mr. and Mrs. Armer have produced a delightful and accurate guide to the cacti and other desert plants. Fifty species are described by Mrs. Armer and illustrated by her husband in such a way that the type of habitat of each plant is plainly shown. The ways in which Indians of the southwest have long used the cacti for food and medicine make entertaining stories. Facts for the amateur cactus-hunter and for the botanist to note are given in separate paragraphs.

Bumblebees and Flowers[4]

Students of fertilization in flowers have a valuable new source of information on the importance of bumblebees in effecting pollination, in a recent volume by Otto Emil Plath, professor of biology at Boston University. While the book is primarily a study of the life history and habits of the bumblebees in North America, included in the description of each of the 17 species treated is a list of the favorite flowers of each. In addition, one chapter is devoted to the economic importance of the bumblebees, especially in relation to feed crops and garden flowers.

Carol H. Woodward.

A Non-Technical Guide to Local Plants[5]

Those persons who have tried in vain to use the more or less technical keys in botanical manuals to find the desired name of a plant or flower, only to find the terms used too unfamiliar to be of easy or quick use, should welcome the appearance of such a pamphlet as Miss Barrett has written.

For submerged and surface-floating aquatics, autumn-flowering monocotyledons and autumn-flowering composites, the author has

[3] Armer, Laura Adams. Cactus, with illustrations by Sidney Armer. Pp. 150. Frederick A. Stokes Co. New York. 1934. $1.50.

[4] Plath, Otto Emil. Bumblebees and their ways. Pp. i–xvi + 1–201. Pl. I–X. Text figures 1–20. The Macmillan Co. 1934. $4.00.

[5] Barrett, Mary Franklin. Three keys to wild flowering plants of Connecticut, southeastern New York, New Jersey, and eastern Pennsylvania. 46 pages, 2 plates. M. F. Barrett, 64 Park Avenue, Bloomfield, New Jersey.

written a series of keys differentiating the species by easily visible characters, and all couched in the most easily understandable words, those few technical terms or even out of the ordinary terms used being thoroughly explained in a glossary. The index is also helpful, as in it the scientific names are coupled with the common names, which increases its usefulness.

On the whole Miss Barrett has executed a very satisfactory piece of work for the non-technical flower-lover, and it is to be hoped that similar keys for the other plants of the Metropolitan region will appear from her pen.

EDWARD J. ALEXANDER.

A GLANCE AT CURRENT LITERATURE[1]

Landscape and Garden is the title of a new publication issued in England under the auspices of the Institute of Landscape Architects, with the aim of making the journal of the institute a guide to the general public as well as to members of the profession. Its first issue contains photographs and notes concerning both large and small places in which landscaping and horticulture are essential features. The second quarterly number, it was announced, would contain a special supplement dealing with garden cities since the war. Richard Sudell is the editor.

* * * *

Three recent numbers of the *Lexington Leaflets* by Stephen F. Hamblin, published by the Lexington (Mass.) Botanic Garden, give interesting information on trilliums, on rock-garden plants of drooping habit, and on rosette and cushion plants for the rock garden.

* * * *

Hardy forsythias are the subject of the Arnold Arboretum's *Bulletin of Popular Information* dated May 14.

* * * *

Three valuable new pamphlets for the flower and vegetable gardener are "History, Culture, and Varieties of Summer-flowering Phloxes" by A. M. S. Pridham (Bulletin 588 of the Cornell Uni-

[1] All publications mentioned here—and many others -may be found in the Library of The New York Botanical Garden, in the Museum Building.

versity Agricultural Experiment Station); "Narcissus for Garden and Home" by H. M. Beikart (Extension Bulletin 119 of the New Jersey State College of Agriculture); and "Descriptions of Types of Principal American Varieties of Garden Peas" by D. N. Shoemaker and E. J. Delwiche (Miscellaneous Publication No. 170 of the United States Department of Agriculture). All are thoroughly illustrated, the last-named with full-page color plates.

* * * *

The October–December *American Fern Journal* describes the fern exhibit at the Century of Progress exposition in Chicago last summer, which many visitors will remember as one of the most delightful features of the horticultural section. The entire diorama was planned and executed by Kathryn E. Boydston.

* * * *

The earliest hybridizers of plants have been unearthed by Conway Zirkle, who reproduces quotations and photographs of records of crosses made in the sixteenth and seventeenth centuries in America and Europe. The article appears in *The Journal of Heredity* for January.

* * * *

Discouraged growers of gladiolus will welcome the newest publication of Michigan State College Agricultural Experiment Station. Entitled "Gladiolus Culture, Insects, and Diseases," it is listed as Circular Bulletin No. 149.

* * * *

Emphasizing the coöperation necessary among various sciences in order to make progress in the long-neglected study of the desert, Dr. Forrest Shreve, of the Desert Laboratory of the Carnegie Institution, writes on "The Problems of the Desert" in the March *Scientific Monthly*. In the same issue is an interesting report of a radio talk on mosses given by Dr. A. J. Grout.

* * * *

Special mention of native American plants, their color and time of blooming and their habit of growth, is made by Mildred Norton Andrews, writing in the March *Gardeners' Chronicle of America*. "Planting along the Brook" is her subject.

* * * *

In the April *Nature Magazine*, F. F. Rockwell concludes a series of three articles on propagation by dealing with such subjects as

iris, peonies, and phlox, which can best be divided. Seeds and cuttings were previously treated.

* * * *

The nineteenth *American Rose Annual* is now on the library shelf. As usual, it gives important data on the growing of roses, refers to many interesting varieties, including the fragrant roses of yesterday, and offers practical warnings to avert winter damage and disease.

* * * *

In the current *Proceedings* (Vol. 7) of the Staten Island Institute of Arts and Sciences appears a biography of Dr. Arthur Hollick, with a complete bibliography of his works.

* * * *

"How to Feed a Shade Tree" is the leading article in the April *Missouri Botanical Garden Bulletin.* It is illustrated with photographs, diagrams, and tables compiled from observations.

* * * *

The New Flora and Silva began in April a series of articles on "Cultivated Plants and their Introduction," being mainly brief biographies of plant collectors and introducers.

* * * *

Out-of-the-ordinary flowers from the new catalogues, according to R. M. Carleton in the May *Flower Grower,* include a perennial Cynoglossum, an annual Rudbeckia, a pink Shasta daisy, an all-red annual Gaillardia, a new Platycodon with flowers four inches across, a pink perennial candytuft, and new salvias in blue, purple, white, and rose.

* * * *

Aquatic plants suitable for use in home aquaria and pools are described in an elaborately illustrated article, based in part on the recent aquatic exhibit at the Garden, by E. J. Alexander, Assistant Curator, in the May–June issue of *Natural History,* published by the American Museum of Natural History.

* * * *

In making possible, by means of keys, complete descriptions, and clearly detailed drawings, the identification of forage grasses by their vegetative characters, R. F. Copple and A. E. Aldous have done a unique and significant piece of ecological research. Published as Technical Bulletin 32 of the Kansas Agricultural Experi-

ment Station, their work is designed as an aid in range forage investigations, which are of particular importance in that state, though of wide significance throughout the country's grazing lands.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

Mrs. Harold McL. Turner, a member of the Advisory Council, spent several days at the Garden during July in supervising the naturalistic planting of daylilies in the North Meadow and on conspicuous parts of the knolls facing Fordham Hospital. Several hundred seedlings were planted to extend the plantings which Mrs. Turner has voluntarily planned and superintended during the past few years.

Professor Y. Yamamoto of the Taihoku Imperial University, Taihoku, Formosa, is spending the summer months at The New York Botanical Garden studying specimens from the Augustine Henry collection of Formosan plants. This collection, made during the latter part of the nineteenth century, is the one on which the first enumeration of Formosan plants, published in 1896, was based. Professor Yamamoto, who has already completed a five-volume work, Supplementa Iconum Plantarum Formosanarum, is now working on a continuation of his Observationes ad Floram Formosanam, of which nine parts are so far finished. He is giving special attention to the distribution of Formosan plants in eastern Asia.

Mrs. Daniel Guggenheim has generously presented to the Botanical Garden a collection of thirty large palms and two large ferns (*Cibotium*). This gift forms a valuable accession to our living collections. The largest palms in the collection exceed 20 feet in height.

Doctor Charles Chupp of the Department of Plant Pathology, Cornell University, spent part of July at the Garden examining about 200 types and cotypes of *Cercospora,* a genus of parasitic fungi.

Galley proofs have already been received for the twenty-four-year index to *Mycologia*, which is to be published the first of the year. More than 200 advance subscriptions have been received. The cost of this index is $2.50 unbound and $3.00 bound, until December 31, fifty cents being added after publication.

Mr. B. A. Krukoff sailed August 2nd on his fifth expedition to Amazonia, where he plans to make further collections near the headwaters of the Madeira River. He expects to return to this country in February or March.

Doctor Charles Baehni, Assistant at the Botanical Garden of Geneva, Switzerland, stopped at The New York Botanical Garden late in July on his way to Chicago, where he will spend a year in botanical research at the Field Museum of Natural History.

Mr. Egbert H. Walker of the Smithsonian Institution in Washington returned to the Botanical Garden in July for further work on the bibliography of eastern Asiatic botany, on which he is collaborating with Doctor Merrill.

A new volume under the title of "The Myxomycetes" has recently appeared, written by the late Professor Thomas H. Macbride and Dr. George W. Martin of the University of Iowa. It is based on two previous editions of the North American Slime Moulds by the senior author, who passed away just before the new book came off the press and whose biography and portrait will appear in the September-October issue of *Mycologia*. The Myxomycetes comprise one of the groups of lower organisms which partake of the characters of both animals and plants. They are, however, usually placed with the latter. The junior author has very kindly agreed to write this group for *North American Flora*. This monograph will represent the first part of the first volume of this important work which is being published by The New York Botanical Garden.

PUBLICATIONS OF

THE NEW YORK BOTANICAL GARDEN

Journal of The New York Botanical Garden, monthly, containing notes, news, and non-technical articles. Free to members of the Garden. To others, 10 cents a copy; $1.00 a year. Now in its thirty-fifth volume.

Mycologia, bimonthly, devoted to fungi, including lichens; $5.00 a year. Now in its twenty-sixth volume. Official organ of the Mycological Society of America.

Addisonia, semi-annual, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Subscription price, $10.00 a volume (two years). [Not offered in exchange.] Now in its eighteenth volume.

Bulletin of The New York Botanical Garden, containing reports of the Director-in-Chief and other official documents, and technical articles embodying results of investigations. Free to all members of the Garden; to others, $3.00 per volume. Now in its fourteenth volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes. Roy. 8vo. Each volume to consist of four or more parts. 74 parts now issued. Subscription price, $1.50 per part; a limited number of separate parts will be sold for $2.00 each. [Not offered in exchange.]

Memoirs of The New York Botanical Garden. Price to members of the Garden, vols. I–VI, $1.50 per volume; to others, $3.00. Vol. VII, $2.50 to members; to others, $5.00.

Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. ix + 492 pp., with map. 1900.

Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. xvi + 320 pp., with 176 figures. 1903.

Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by A. Hollick and E. C. Jeffrey. xiii + 138 pp., with 29 plates. 1909.

Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. viii + 478 pp., with 73 figures and 14 plates. 1908.

Vol. V. Flora of the Vicinity of New York: A Contribution to Plant Geography, by Norman Taylor. vi + 683 pp., with 9 plates. 1915.

Vol. VI. Papers presented at the Celebration of the Twentieth Anniversary of The New York Botanical Garden. viii + 594 pp., with 43 plates and many text figures. 1916.

Vol. VII. Includes New Myxophyceae from Porto Rico, by N. L. Gardner; The Flower Behavior of Avocados, by A. B. Stout; Descriptions of New Genera and Species of Plants Collected on the Mulford Biological Exploration of the Amazon Valley, 1921–1922, by H. H. Rusby; and The Flora of the Saint Eugene Silts, Kootenay Valley, British Columbia, by Arthur Hollick. viii + 464 pp., with 47 plates, 10 charts, and 11 text-figures. 1927.

Brittonia. A series of botanical papers. Subscription price, $5.00 per volume. Now in its first volume.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. In the fourteenth volume.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pp. and 601 figures. Price, $5.50 postpaid.

THE NEW YORK BOTANICAL GARDEN

Bronx Park, New York, N. Y.

GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, tulips, lilacs, irises, peonies, roses, lilies, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 43,500 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10

Contributions to the Garden may be deducted from taxable incomes.

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I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

All requests for further information should be sent to

THE NEW YORK BOTANICAL GARDEN
BRONX PARK, NEW YORK, N. Y.

VOL. XXXV SEPTEMBER, 1934 No. 417

JOURNAL OF THE NEW YORK BOTANICAL GARDEN

FERNS WITHIN ONE HUNDRED MILES OF NEW YORK CITY
JOHN K. SMALL

TRIFOLIUM VIRGINICUM IN CULTIVATION
T. H. EVERETT

THE ELIZABETH GERTRUDE BRITTON MOSS HERBARIUM IS ESTABLISHED
E. D. MERRILL

SCIENCE COURSE FOR PROFESSIONAL GARDENERS ENTERS THIRD YEAR

PUBLIC LECTURES SCHEDULED FOR SEPTEMBER, OCTOBER, AND NOVEMBER

A GLANCE AT CURRENT LITERATURE
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NOTES, NEWS, AND COMMENT

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THE NEW YORK BOTANICAL GARDEN

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JOURNAL
OF
The New York Botanical Garden

VOL. XXXV SEPTEMBER, 1934 NO. 417

FERNS WITHIN ONE HUNDRED MILES OF NEW YORK CITY[1]

Manhattan Island has outstanding botanical characteristics. So far as ferns are concerned, nature, after the last Ice Age, continued to build up a luxuriant growth on the island. This survived until the activities of the white man from Europe inaugurated changes on the surface of the land. Since modern history began on Manhattan the fern growth has gradually dwindled to almost nil. The same processes of destruction that reduced the fern growth on Manhattan have been and are operating nearly throughout the Local Flora area.

Through its geological formation Manhattan represents the southern tip of one of the larger plant-provinces—the New England Coast Region. It was originally a wedge of ancient crystalline rock flanked on either side by portions of other plant-provinces, one the latest formation, the Coastal Plain, the other the oldest formation, the Piedmont.[2] These two plant-provinces coincide with the geological formations of the same names.

The amateur botanists of Manhattan and vicinity were the first on the Atlantic seaboard to organize themselves into an association

[1] This note is published as a basic plan for field work looking toward a detailed monograph on the ferns of the general region and the minor areas outlined on the following pages.

[2] Just after the Ice Ages Manhattan was for the most part a bare rocky island. As the Coastal Plain province was formed sand was deposited with the remains of the glacial drift over the lower parts of the eastern edge and the low positions south of the present 59th Street.

—The Torrey Botanical Club[3]—for the study of plants from a botanical standpoint, growing naturally within a certain area. In this case an area two hundred miles in diameter with Manhattan Island at the center was designated. This region has come to be known as the Local Flora area.

Exploration for plants and the collecting of specimens within this area has been carried on officially and otherwise for over a half century. The specimens were preserved in various private herbaria. Mainly through the activities of the Local Flora committee, the Torrey Botanical Club gradually built up an herbarium of the local plants. The enthusiasm with which the work of the Local Flora committee was carried on varied according to the time, opportunity, and interests of the members and their associates. Eventually, the Club presented its local flora herbarium to the Board of Managers of the Garden.

One of the early activities of the Garden's botanical work, before the accession of the herbarium of the Torrey Botanical Club, was the beginning of a local flora herbarium. When the Club's herbarium was turned over to the Garden, the two collections were merged. During the past three decades miscellaneous collections of plants from the Local Flora area and several large private herbaria have been incorporated with the original nucleus. Now, there is a large herbarium of local plants available for consultation or study to any one qualified for such work.

This note is based on collections of ferns preserved in the herbarium of The New York Botanical Garden, besides studies in the field, both within and without the Local Flora area.[4]

The Local Flora area is an arbitrary assemblage of parts of several major and minor plant-provinces. Curiously enough, this area

[3] The Torrey Botanical Club is the oldest botanical society in the United States, its present organization dating from December, 1867; its incorporation was effected in January, 1873. The *Bulletin of the Torrey Botanical Club,* the oldest botanical journal in America, was commenced in 1870; it is now in its 61st volume. The Club also publishes a journal called *Torreya,* and a series entitled *Memoirs.* The membership, at first only about 30, all living in or near New York City, now numbers about 500, widely distributed geographically, although the meetings are still held in New York. The Club was responsible for the establishment of The New York Botanical Garden.—JOHN HENDLEY BARNHART.

[4] The word fern is used here in the broad sense covering the groups of fern-allies as well as the true ferns.

represents the most complicated assemblage of plant-provinces, five in number, to be found in any similar-sized area in all of North America. The flora is thus large for the size of the area, and the floristics complicated. The very ancient history of the land has had a profound effect on the floristics. The outstanding influences in

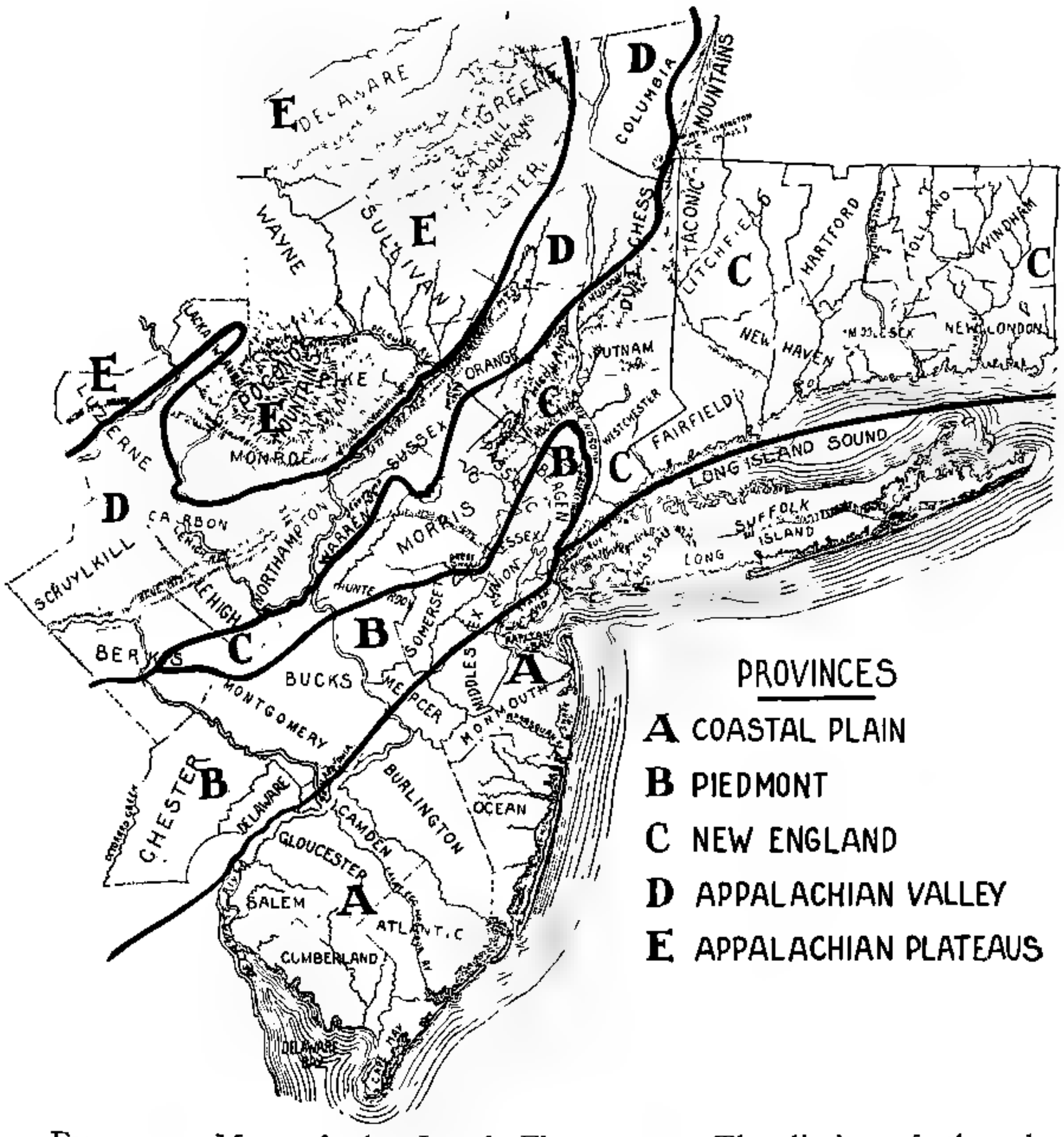

FIGURE 1. Map of the Local Flora area. The limits of the plant provinces are shown by heavy black lines. The southern limit of the glaciers, the terminal moraine, is shown by the line in hachure running across Long Island and northern New Jersey into Pennsylvania.

modifying the more ancient floristics involving the direct ancestors of our modern plants were the Ice Ages. During these periods more than half of the local flora area was buried beneath prodigious ice sheets. The vegetation was wiped out and the configuration of the surface of the land was more or less modified.

The greater part of the more southern portion of the local flora area has had a continuous plant covering since very early times, whereas the portion north of the terminal moraine[5] was repopulated largely by immigrants after the ice receded to the north.

PLANT PROVINCES

The plant provinces involved in the Local Flora area are five. The newest formation is the coastal region of our area—the Coastal Plain. The boundary of this province extends from the northern tip of Delaware diagonally across New Jersey, thence to Staten Island and Long Island, where it leaves two sections on the front shore of the former island and the whole front of the latter.

Northwestward the Coastal Plain abuts on two provinces of the very old formations: one, the Piedmont, extending up from Georgia through eastern Pennsylvania and, as a tongue, along the Hudson River to Rockland County, New York; beyond this point the Coastal Plain abuts on the New England province. This extends southward as two tongues or wedges, one ending near Reading in eastern Pennsylvania, the other wedge in the form of Manhattan Island, or New York City.

The remaining two provinces are northward extensions from less ancient eroded uplifts from the south. The one bordering the New England province is the Appalachian Valley province, which begins in central Alabama, extending northeastward just west of the Blue Ridge province, which however ends in southern Pennsylvania, a short distance southwest of Harrisburg and outside our area. The most western part of the Local Flora area belongs to the northern extension of the Appalachian Plateaus province which, beginning in northwestern Alabama, extends in a northeasterly direction up to the Adirondack province in northern New York, which also lies out of our area.

The interlocking of plant-provinces and the altitudinal range from below sea-level, where aquatics grow, to mountain-tops, where alpines thrive, result in a great variety of plants, ferns included. The major groups of temperate fern-plants are well represented in the Local Flora area—all of them by more than one species.

[5] The terminals of the glaciers formed a line across Long Island, Staten Island, northern New Jersey, northern Pennsylvania, south of the Great Lakes and westward.

FERNS AS KNOWN TO LINNAEUS

In 1753 Carolus Linnaeus was acquainted with almost 50 per cent of the fern-plants now represented in the Local Flora range. He recorded 40 binomials, citing the species under 12 generic designations. Today the generic segregates comprise 21 names. Only 21 of the original Linnaean binomials stand, but this is over fifty per cent of his total. The generic names the fern student learns early in his studies: *Polypodium, Adiantum, Pteris, Asplenium, Onoclea, Osmunda, Marsilea, Equisetum,* and *Lycopodium.*

As a result of the complicated geological structure, and consequent interlocking of the provinces, plus the history of the area concerned and the rather uniform climatic conditions, the ferns of the Local Flora area are as a rule generally distributed. However, the plant provinces show some individuality and isolation of genera and species. Tentatively the following may be recorded:

A. For the Coastal Plain Province, curly-grass, *Schizaea pusilla,* and two lycopods, *Lycopodium alopecuroides* and *L. carolinianum.* B. For the Piedmont Province, none known at present. C. For the Appalachian Valley Province, *Asplenium Bradleyi.* D. For the Appalachian Plateaus Province, *Lycopodium porophilum.* E. For the New England Province, none known at present.

OUTSTANDING REGIONS

The area under consideration, for the convenience of the study of plant distribution, may be divided into major and minor regions.

1. Major Regions

A. Glaciated Region. Here we find the oldest area, for the most part, geologically, and the newest floristically. The plant covering that had developed there before the Ice Ages was exterminated by the ice sheets that covered the region, varying from a few feet to thousands of feet in thickness. The ancestors of the present vegetation came in and developed after the recession of the last ice sheet. The maximum altitude in the glaciated area is 4,204 feet in the Catskills.

Ferns restricted to the glaciated area today are few: holly-fern, *Polystichum Braunii*; shield-fern, *Dryopteris americana*; cliff-

brake, *Cryptogramma Stelleri*; lycopod, *Lycopodium annotinum*; horsetail, *Equisetum variegatum*.

B. Unglaciated Region. Here we find, at least in the case of the Coastal Plain, the newest area geologically and, for the most part, the oldest floristically. The original plant covering survived after the several ice sheets had worked destruction north of the terminal moraine, and it is likely that various specimens that would have remained northern types were forced down into the southern lowlands and highlands. The maximum altitude in the unglaciated region is approximately 2,000 feet. The ferns restricted to the unglaciated area are: curly-grass, *Schizaea pusilla*; lycopod, *Lycopodium carolinianum*.

2. Minor Regions

Within the boundaries of the major regions are various minor regions.

A. Rivers and River Valleys. North of the moraine the country is copiously cut by mostly short rivers and creeks. Most prominent are those rising beyond our range. The Connecticut River, with small tributaries, rises in the White and Green Mountains, and adjacent Canada. The Housatonic River rises in Massachusetts east and north of the Taconic Mountains. The Hudson River, with mostly small tributaries, rises in the Adirondack Mountains. These rivers and their confluents are wholly confined to the glaciated part of our range. The Delaware River, on the other hand, although it rises in the glaciated region in the western and southern part of the Catskill Mountains, and has a long course north of the moraine, crosses the moraine and receives two large tributaries, the Lehigh River and the Schuylkill River, both of which, however, rise in the glaciated area. The Lehigh crosses the moraine in Pennsylvania, and the Schuylkill crosses the Blue Mountains in the same State, continuing on to Delaware Bay. Their influence, however, is for the most part in the unglaciated area. The Susquehanna River affects only two counties (Luzerne and Lackawanna) on the western edge of our range.

The surface of the glaciated area, also, as a result of glaciation and attendant deposition of débris, shows many confined wet places, such as swamps, marshes, bogs, and lakes, suitable places for wood-ferns and swamp-ferns, and, on the other hand, boulders, rock-out-

crops, cliffs, and crags to the liking of rock-ferns. South of the moraine, confined water and water-courses are conspicuously fewer. The moist and wet regions harbor what may be termed wood-ferns and swamp-ferns. These habitats are more or less dove-tailed, so that it is often difficult to assign a fern species definitely to one or the other. However, as the dominant habitat appears to be indicated in the region under consideration, we find:

1. **Wood-ferns**: polypody, *Polypodium virginianum*; brake, *Pteris latiuscula*; maidenhair, *Adiantum pedatum*; swamp-spleenwort, *Athyrium pycnocarpon,* and its cousins, the lady-ferns, *A. asplenioides, A. thelypteroides*; shield-ferns, *Dryopteris noveboracensis, D. marginalis, D. Goldieana, D. intermedia, D. spinulosa, D. americana*; holly-ferns, *Polystichum acrostichoides, P. Braunii*; hay-scented fern, *Dennstaedtia punctilobula*; ostrich-fern, *Matteuccia Struthiopteris*; Clayton's-fern, *Osmunda Claytoniana*; adder's-tongue, *Ophioglossum vulgatum*; grape-ferns, *Botrychium lanceolatum, B. simplex, B. neglectum, B. obliquum, B. dissectum, B. silaifolium, B. virginianum*; horsetails, *Equisetum arvense, E. pratense, E. sylvaticum, E. variegatum, E. hiemale*; lycopods, *Lycopodium lucidulum, L. obscurum, L. annotinum, L. clavatum, L. complanatum, L. tristachyum.*

2. **Swamp-ferns**: Virginia chain-fern, *Anchistea virginica*; netted chain-fern, *Lorinseria areolata*; sensitive-fern, *Onoclea sensibilis*; curly-grass, *Schizaea pusilla*; osmundas, *Osmunda regalis, O. cinnamomea*; horsetails, *Equisetum palustre, E. littorale, E. fluviatile*; lycopods, *Lycopodium inundatum, L. adpressum, L. alopecuroides, L. caroliniamum*; selaginellas, *Selaginella apoda*; quillworts, *Isoëtes Braunii, I. Eatoni, I. riparia, I. macrospora, I. Tuckermanii, I. Engelmanni.*

3. **Bog-ferns**: shield-fern, *Dryopteris simulata, D. Thelypteris, D. cristata, D. Clintoniana;* sensitive-fern, *Onoclea sensibilis*; climbing-fern, *Lygodium palmatum.*

Wood-ferns and swamp-ferns predominate in river and river-valley regions, and also occur in the ridges and highlands and on the dissected plateau, as described below. Rock-ferns also occur in the river valleys, but they form more prominent groups in the region comprising ridges and highlands. In this region most of the ferns occur at the minimum altitudes.

Native aquatic ferns are lacking in the local flora range. However, three have found their way into the limits either through cultivation or accident: **Aquatic-ferns**: pepperwort, *Marsilea quadrifolia*; mosquito-fern, *Azolla caroliniana*; floating-moss, *Salvinia natans*.

B. Ridges and Highlands. North of the moraine there are several ridges with northeast-southwest trend. First, the Taconic Mountains on the New York–Massachusetts state line and the New York–Connecticut state line. The maximum altitude within our area is 2,340 feet. Second, the ridge that begins in Ulster County, New York, as the Shawangunk Mountains, with a maximum altitude of 2,273 feet, continues as Kittatiny Mountain in New Jersey, with a maximum altitude of 1,800 feet, and, crossing the moraine into Pennsylvania, becomes the Blue Mountain with an altitude of 2,000 feet.

In New Jersey, on the eastern edge of the Piedmont abutting on the New England Province along the Hudson River, are the Palisades, an outcrop of diabase in columnar form, with recurring ridges westward. The maximum altitude of the Palisades along the Hudson is about 500 feet, while an elevation slightly set off rises to 532 feet. In New York north of the Palisades in the vicinity of the Hudson River there are the Highlands of the Hudson. The Hudson River bisects this ridge at Cornwall. The ridge has a northeasterly trend, and attains a maximum altitude of 1,640 feet above sea-level.

A minor elevation just west of the Hudson Highlands is Skunnemunk Mountain. This shows a maximum altitude of 1,690 feet.

Glaciation on the one hand and general erosion on the other have prepared many habitats suitable for rock-loving ferns: **Rock-ferns**: hairy-lip-fern, *Cheilanthes lanosa*; cliff-brakes, *Pellaea atropurpurea, P glabella*; spleenwort, *Asplenium pinnatifidum, A. ebenoides, A. Trichomanes, A. platyneuron, A. montanum, A. cryptolepis, A. Bradleyi*; walking-fern, *Camptosorus rhizophyllus*; cup-ferns, *Cystopteris fragilis, C. bulbifera*; star-ferns, *Woodsia ilvensis, W. obtusa.*

The ridges and highlands contain, in addition, many habitats for wood-ferns and swamp-ferns. This region also furnishes the medium high altitudes in the local flora region.

C. Dissected Plateaus. The Catskill Mountains represent one of the two most rugged areas in New York State, the other area being the Adirondacks, which, however, are outside our range. The entire region is deeply dissected, even sharply so, with many areas of sheer cliff, especially around and near the summit of the peaks. Since the rocks of this area are not folded as are true mountains, but nearly horizontal with a slight northwesterly dip, there is no definite trend to the ridges; they are set at all sorts of angles to one another. The higher elevations in the Local Flora area occur in this region, the climax being reached in Slide Mountain, 4,204 feet above sea-level, while there are numerous peaks above 3,500 feet.

Here the maximum of altitude and ruggedness is reached. Of course there are habitats for all groups of ferns in the Catskills. Many of the common ferns reach their maximum altitudinal distribution there. The following may be mentioned which reach nearly or quite to the 4,000-foot contour: spleenworts, *Asplenium montanum, A. cryptolepis*; swamp-spleenwort, *Athyrium pycnocarpon;* lady-fern, *Athyrium thelypteroides*; walking-fern, *Camptosorus rhizophyllus*; shield-ferns, *Dryopteris Goldieana, D. spinulosa, D. americana*; holly-fern, *Polystichum Braunii*; beech-ferns, *Phegopteris hexagonoptera, P Phegopteris*; oak-fern, *Phegopteris Dryopteris*; cup-fern, *Cystopteris fragilis*; star-ferns, *Woodsia ilvensis, W. obtusa*; lycopod, *Lycopodium annotinum.*

The Pocono Mountains in northeastern Pennsylvania represent a maturely dissected plateau about 2,100 feet in altitude, consisting of numerous rather flat ridges, with a sharp escarpment fronting on the Delaware River. The plateau grades southwestward into the more sharply and deeply dissected portion of the Alleghenies, where the gorge of the Lehigh River is a sharply outstanding physical feature. The ridges in this southwestern area are much more pronounced in their northeast-southwest trend and more highly folded in structure.

EXTRA-LIMITAL RELATIONSHIPS

The ferns of the local flora and their relatives are largely those whose genera show a north and south trend in their distribution. This fact comes out both in the species and in certain points in their structure. In the matter of an increase of species either north or south the following notes are of interest.

Eighty six species of ferns are now recorded for the Local Flora area. This is about 41 per cent of the 211 fern-plants in North America east of the Mississippi River. It is about 72 per cent of the 119 ferns of the northeastern United States and eastern Canada. It is about 52 per cent of the 167 ferns of the southeastern United States. Considered under family headings we find:

1. **Polypodiaceae**—Fern Family

The genera *Polypodium, Pteris, Adiantum, Cheilanthes, Asplenium*, and *Dryopteris* are more generously or wholly represented by additional species in the south. The genera *Cystopteris* and *Woodsia*, on the other hand, are augmented more northward. The genus *Dennstaedtia* has one relative, a tropical species, in southern Florida.

2. **Schizaeaceae**—Curly-grass Family

The curly-grass, *Schizaea pusilla*, represented by the same species northward, has a generic counterpart of the extreme south in one species, the tropical *Actinostachys Germani*.

3. **Ophioglossaceae**—Adder's-tongue Family

The local flora ferns have interesting relationships beyond our geographic area: A closely related *Ophioglossum, O. Engelmannii,* occurs to the southward and two additional species are in the Gulf States and contiguous territory. On the other hand, the genus *Botrychium* is more abundantly represented in the local flora area than elsewhere.

4. **Marsileaceae and Salviniaceae**

Pepperwort Family and Salvinia Family

The three species representing these families are introduced plants. *Marsilea quadrifolia* is European, although the genus is well represented in our southwest. *Azolla caroliniana* is native north, west, and south of our area, but not so within it. *Salvinia natans* is European, and its only generic relative on the Atlantic seaboard is an introduced species, *S. auriculata* in Florida.

5. **Equisetaceae**—Horsetail Family

The genus *Equisetum* has additional species northward.

6. **Lycopodiaceae**—Clubmoss Family

The genus *Lycopodium* is augmented by several species northward and by two additional species in the southeast.

7. **Selaginellaceae**—Dwarf-lycopod Family

The genus *Selaginella,* besides having one additional species in the northeast, is abundantly augmented in the southeast by seven species.

8. **Isoëtaceae**—Quillwort Family

The quillworts show a northern relationship by an augmentation of fifty per cent more species. Two additional species occur in the southeast.

A study of the specimens and records of the ferns among the local flora has shown that a great deal of collecting remains to be done, mainly for gaining a proper knowledge of the geographic and altitudinal distribution. The ferns of the more populated and agricultural parts are pretty well known and in many places they have been exterminated. It is the uninhabited and virgin river and creek courses and swamps, ridges, plateaus, and mountains and other elevations with exposed rocks, cliffs, and escarpments that need concentrated collecting and study.

Up to the beginning of the present century this lack of detailed knowledge was pardonable, for access to the more remote parts by horse conveyance was at best a slow and tedious task. Since botanical work has been organized, chiefly through The New York Botanical Garden, Brooklyn Botanic Garden, and Boyce Thompson Institute, and with the advent of the automobile and better roads, time necessarily spent for attacking distant points may be largely eliminated and thus saved for foot-work among the more inaccessible places. The failure of a complete fern survey is not pardonable in these days.

JOHN K. SMALL.

TRIFOLIUM VIRGINICUM IN CULTIVATION

Trifolium virginicum is an interesting species of clover which is a local endemic of the shale-barrens of the Appalachian Mountains. So far as can be ascertained from published records it had not been introduced to cultivation until last year, when The New York Botanical Garden Expedition into the Southern Appalachians collected living plants for distribution to members of the syndicate supporting the expedition.

The species was originally described in 1893 by Dr. John K. Small from material collected the previous year on Kates Mountain, West Virginia. The type locality remained the only known station for the species for more than thirty years, but since 1923 it has been discovered in several other places and in 1929 Professor Edgar T. Wherry reported it as then definitely known from eight stations. Three years later he reported having found a colony of this plant in Southern Pennsylvania.

The plants collected by the Southern Appalachian Expedition were obtained from the neighborhood of Burlington, W. Va., where they were found growing in nearly pure shale, a dry and almost sterile medium, packed down hard and scarcely capable of supporting any vegetation. At the time the plants were located a few withered inflorescences remained, but most of the seed had scattered, so it was necessary to dig up living specimens. This was no easy task, for the branched roots are tough and extend downwards for a considerable distance. About a hundred plants were obtained.

Upon arrival at the Botanical Garden they were potted up in a soil made porous by the addition of a liberal amount of coal cinders, and in this medium they grew so well that within a few weeks they were in much better condition than when first collected. The plants were wintered in a coldframe and in the spring of this year a number were planted out in the new Thompson Memorial Rock Garden. The site selected is sunny and well drained and the soil contains a goodly proportion of coal cinders which impart to it a gritty porous quality and render it mechanically suited to the growth of this Trifolium.

The first growth in spring consists of several short branches (one to two inches long) produced from the crown of the plant.

FIGURE 1. Specimens of *Trifolium virginicum* [Small] from the Southern Appalachians, blooming in the Thompson Memorial Rock Garden.

These branches are quite prostrate but do not root into the ground as do the runners of many other clovers. They bear three-foliolate leaves with large obovate, foliaceous stipules. The leaflets are obovate or elliptic and each is marked with a prominent white inverted V.

From the leaf axils the inflorescences are produced, on short peduncles, the cream-colored flowers forming dense spherical heads about one inch in diameter and lying upon the surface of the ground.

About the time the prostrate branches attain their greatest development and while the plants are yet in bloom, a secondary growth occurs, consisting of the production of a number of very short erect sterile branches immediately from the crown of the plant. The leaves on these branches differ markedly in appearance from those developed earlier; the petioles are longer and are erect and have narrower and less conspicuous stipules. The individual leaflets are proportionately longer and narrower, and the white V is not so prominent.

Soon after the blooming season is over the short branches die away, but the long erect leaves persist through the summer and with age the V-mark almost or quite disappears.

Trifolium virginicum blooms in May and lasts over a fairly long season. It is of rather modest appearance and will not appeal to those desiring a magnificent display of color, but is well worthy of a place in the rock garden.

Although plants have not yet been wintered out of doors in the vicinity of New York, there is every reason to expect that they will prove hardy.

T. H. EVERETT

THE ELIZABETH GERTRUDE BRITTON MOSS HERBARIUM IS ESTABLISHED

At its meeting on May 28, 1934, the Board of Managers of The New York Botanical Garden approved a recommendation to the effect that the moss herbarium be henceforth designated as the Elizabeth Gertrude Britton Moss Herbarium in honor of Mrs. Nathaniel Lord Britton, 1858–1934, honorary curator of mosses,

1912–1934. This follows the precedent set in 1907, when the fern herbarium was designated as the Underwood Fern Herbarium, in honor of Dr. Lucien Marcus Underwood.

A recent census of the moss herbarium shows that it now contains 173,060 mounted specimens, besides many thousands of duplicates, forming one of the largest reference collections of this type of material in the world. It contains the great Mitten collection, acquired in 1906, the important August Jaeger collection in the Columbia University deposit, the private herbaria of G. N. Best and E. A. Rau, numerous smaller private herbaria, many thousands of specimens sent to Mrs. Britton during her long years of service for identification, an extensive series of specimens collected by Mrs. Britton in North America and the West Indies, and a fine series of *exsiccati* such as those of Austin, Drummond, Sullivant, Holzinger, Bauer, Grout, and others. It is particularly rich in types and in other historical material. In it is to be found basic material essential to the students of mosses from all parts of the world.

Long antedating the establishment of The New York Botanical Garden, and continuing uninterruptedly to the close of her active life, Mrs. Britton's major interest was centered in the study of mosses, and in the assembling of specimens and literature essential to this end. Mrs. Britton was never a salaried employee of The New York Botanical Garden, serving voluntarily because of her deep personal interest in the group of plants that early attracted her attention and claimed her major interest during her productive career. She was one of the outstanding specialists on this group of plants, and in this field thoroughly established her reputation as a critical and productive botanist. Her interest and devotion to her work were recognized in 1912 when the Board of Managers granted her the title of Honorary Curator of Mosses. It is thus entirely fitting that this great scientific collection, to which Mrs. Britton devoted her full time and energy over a period of fifty-four years, be made a memorial to her.

E. D. Merrill.

SCIENCE COURSE FOR PROFESSIONAL GARDENERS ENTERS THIRD YEAR

The third year of the Science Course for Professional Gardeners opens with classes for both advanced students and beginners Monday, October 1, at 8 p.m., in the rooms of the Horticultural Society of New York, 598 Madison Avenue. Classes will meet every Monday for two terms of twelve weeks each.

This course, which was inaugurated by The New York Botanical Garden in 1932, primarily to give the younger members of the gardening staff a chance to advance by studying the sciences underlying the practice of horticulture, from the first has included many professional gardeners from New York and surrounding areas. This year a number of men who have handled growing plants for florists and nurserymen are also expected to register. At least two years of continuous and successful work with plants is required for admission to the course, which is essentially not a course in gardening, but a course in science for experienced gardeners.

For beginning students, systematic botany and plant morphology will be offered the first term, to be followed in a twelve-week session after Christmas with plant physiology and laboratory work in systematic botany.

Second-year men will be given an opportunity to study soils and fertilizers and entomology the first term, and plant pathology and plant breeding during their final term. Upon the satisfactory completion of the eight courses, The New York Botanical Garden grants a certificate.

As before, the instructors will include Dr. Forman T. McLean, who is also directing the course with the assistance of T. H. Everett, Horticulturist for the Garden; Dr. H. N. Moldenke, Dr. B. O. Dodge, and Dr. A. B. Stout of the Botanical Garden and Dr. E. P. Felt of the Bartlett Tree Research Laboratories. All of the instructors are volunteering their services, which has made it possible to charge each student only a nominal fee of five dollars a subject each term, or a total of twenty dollars a year.

Prospective students in the course are being asked to register in advance with Dr. McLean at the Botanical Garden.

PUBLIC LECTURES SCHEDULED FOR SEPTEMBER, OCTOBER, AND NOVEMBER

Free public lectures at The New York Botanical Garden are being resumed September 8, to be continued throughout the autumn, winter, and spring. They are given, as usual, each Saturday afternoon at 3:30 in the lecture hall in the Museum Building, and are illustrated with colored lantern slides.

During September, October, and November, the following subjects are being given:

Sept. 8. "Rambles in Hawaiian Mountains," Mr. Otto Degener, New York Botanical Garden.
Sept. 15. "Autumn Wild Flowers," Dr. John Hendley Barnhart, Bibliographer and Administrative Assistant.
Sept. 22. "A Tour of the National Parks," Dr. Harold N. Moldenke, Assistant Curator.
Sept. 29. "Dahlias," Dr. Marshall A. Howe, Assistant Director.
Oct. 6. "Where Our Food Plants Come From," Dr. Elmer D. Merrill, Director.
Oct. 13. "Autumn Coloration," Dr. A. B. Stout, Director of the Laboratories.
Oct. 20. "Bacteria in Relation to Diseases of Plants and Animals," Dr. F. D. Chester, New York Botanical Garden.
Oct. 27. "Australia," Dr. Forman T. McLean, Supervisor of Public Education.
Nov. 3. "A Winter in Bermuda," Dr. Fred J. Seaver, Curator.
Nov. 10. "Travels Through Ontario," Dr. S. M. Pady, National Research Council Fellow, New York Botanical Garden.
Nov. 17. "Plant Hunting in the Southern Appalachians," Mr. E. J. Alexander, Assistant Curator and Curator of the Local Herbarium.
Nov. 24. "Hybridizing the Mold Fungi," Dr. B. O. Dodge, Plant Pathologist.

A GLANCE AT CURRENT LITERATURE[1]

Hardy bulbs for continuous bloom in the garden is one of the topics in *Horticulture* for August 1. A full-page table indicating treatment and seasons of bloom accompanies the article.

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In describing flowers to give late color in the border, Anderson McCully, in the August *Gardeners' Chronicle of America,* names many useful plants and suggests combinations to use.

[1] All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

Gladiolus, Delphinium, and Iris are three genera of garden flowers given special treatment in the August *Flower Grower.* Another useful article tells how native wild flowers are best grown in the garden.

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Several scented plants, especially suitable for rock gardens, are described in the *Lexington Botanic Leaflets* for June 9, July 14, and July 28.

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The *Plant Disease Reporter,* issued by the Plant Disease Survey of the United States Department of Agriculture, begs people observing plant diseases anywhere in the United States to report such diseases at once to the office of the publication in Washington, D. C.

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Among recent important bulletins from Cornell University are one on the Dutch elm-disease (No. 230); one on ornamental trees for New York State (Extension Bulletin 287) and one on the control of diseases and insect pests of potatoes on Long Island (Extension Bulletin 288).

* * * *

Two recent reprints from the *Journal of Allergy* received by the library are "Survey of a Botanical Oasis in the Desert of Northern Arizona" by R. W. Lamson and Alva Watry, and a second study by these two authors dealing with pollinosis as a regional problem.

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Treatment of the Rubiaceae (Madder Family) by Paul Carpenter Standley is continued in Part 3 of Volume 32 of *North American Flora,* which has just appeared.

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In Educational Bulletin No. 61 of the Bartlett Tree Research Laboratories, Dr. E. P. Felt advocates a planned program for the conservation of shade trees. He outlines the damages done by the major pests of trees and briefly describes remedial measures.

* * * *

The third edition of "Observed Flora of Watchung, N. J., and its Immediate Vicinity," by Harold N. Moldenke, Assistant Curator at the Botanical Garden, appeared in March. The continent

of origin of each exotic plant is mentioned, and the booklet also contains a classification of the plant kingdom to orders.

* * * *

Leon Croizat, who has done some research through the library and other facilities at the Botanical Garden, has recently published "A Study of Succulent Euphorbiae."

* * * *

The plant life of Highlands Hammock, near Sebring, Florida, is described in a recently published booklet which states that the purpose of this property of many hundreds of acres is: "To make accessible and to conserve in their natural state the vegetation and all forms of animal life herein." This vast estate, which was visited in February by Dr. E. D. Merrill, was acquired and developed through the personal interest of the late Mrs. John A. Roebling, and is now being maintained for the benefit of the public as Highlands Hammock, Inc., with Mr. Rex Beach as the president of the governing board.

* * * *

Those who have been attracted by the Garden's collection of historical microscopes on the second floor in the Museum Building will be interested in Gustav Fassin's "Early History of the Microscope" in the May *Scientific Monthly*.

In "The Plant Communities of the Dunes" in the same issue, George D. Fuller says, "There is no better place for the plant scientist to see how new land is formed and how it becomes mature soil with its succession of vegetation."

* * * *

The May *Gardeners' Chronicle of America* is packed with articles of unusual interest. Lester Rowntree describes distinctive material for the cutting garden; Charles W. Barr writes on "The Art of Tree Grouping," Cecile Hulse Matschat on "Little Bulbs from Mexico," and Alice Lindsley Dustan on "Vines for the City Garden." Two articles on rock gardens are also included.

* * * *

"The Oriental Flowering Cherries" is the title of Circular 313 of the United States Department of Agriculture, by Paul Russell. Photographs, detail drawings, and keys for classification are given, as well as cultural directions.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

A new exhibit, showing the stages and effects of the Dutch elm-disease and its contributory causes, has been placed on the stair-landing in the Museum Building at the Botanical Garden. It has been prepared in part by F. D. Chester, who has been making special studies of the disease, and in part by Joseph Saitta, who is also an assistant in the department of plant pathology. It first depicts infected trees in and near Bronx Park which have been recently cut and burned by the Botanical Garden. Through branches taken from these trees, it shows how the elm-bark beetle, *Scolytus multistriatus*, lives beneath the bark, boring tunnels and eventually emerging through a hole it makes in the bark; how it infects other trees by inoculating them, in the crotches of twigs where it feeds, with the causative fungus, *Graphium Ulmi*,[1] if it has been living in a diseased tree. It also describes the danger of neglecting to apprehend and cut and burn diseased trees without delay.

At the annual show of the Metropolitan Gladiolus Society, staged at The New York Botanical Garden August 9–11, three spikes of the deep pink variety Robert Treat won first place in the popularity contest. For the best single spike on exhibit, first prize was given to the yellowish-pink Picardy. The flowers as a whole appeared to be in better condition than for several years.

T. H. Everett, Horticulturist, is spending five weeks in England, visiting Kew and other botanic gardens and many private estates and lecturing on The New York Botanical Garden's expedition into the southern Appalachians in the autumn of 1933.

Dr. L. B. Smith of the Gray Herbarium, Harvard University, spent some time in August at the Botanical Garden, studying the Bromeliaceae.

ERRATUM

Through a regrettable *lapsus*—not the printer's—the date of the death of the late Dr. N. L. Britton appears on page 169 of the August JOURNAL as January 25 instead of June 25, though correctly stated below the portrait facing that page.

[1] Known also, through its sexual stage, as *Ceratostomella Ulmi*.

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Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, tulips, lilacs, irises, peonies, roses, lilies, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 43,500 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

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Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

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THE NEW YORK BOTANICAL GARDEN
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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

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A MYCOLOGICAL FORAY

BOOK REVIEWS
A. B. STOUT
EDWARD J. ALEXANDER

A GLANCE AT CURRENT LITERATURE
CAROL H. WOODWARD

NOTES, NEWS, AND COMMENT

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AFTER-EFFECTS OF THE WINTER

Many plants which seemed to be perfectly healthy and unharmed when first investigated disappointed us later, either by partially dying after they had produced young leaves, or by starting their leaf growth hesitatingly and then only in part. Others, including even some of our native trees, like oaks and maples, died during the summer, usually beginning with the top branches, although they had shown no signs of injury until then.

These losses, after everybody thought the danger was all over, have caused more despair and brought more appeals for help than all the other winter injuries combined. Is there anything that can be done about these after-effects? Yes, there is. But first we must understand what are their underlying causes.

The first type of injury was quite conspicuous with many shrubs, for instance, *Deutzia, Viburnum, Lonicera, Philadelphus,* etc. On investigation it became apparent that on the tips of the tall old shoots, where the young sprouts and leaves had wilted and died, the bark and cambium of the stem were fresh and healthy. The injury had not occurred there. Following the trunk down to the ground we found near its base, some 6 to 12 inches from the ground, a zone where the bark was loose and dead and the cambium brown and decayed. In a later stage even the wood was brown and dead. In many cases fungus infection was noticeable in these places even to the naked eye.

The injury which had occurred here was twofold and was caused directly or indirectly by the snow. It consisted either in mechan-

FIGURE 1. Oak tree (*Quercus alba*), uprooted in a storm. Notice its shallow root-system and the rocky ledges which had prevented it from obtaining a firm hold. The tree had been in a dying condition for some time because of drought and frost injury to its roots.

ical injury caused by the rubbing of the wind-swayed shoots against the sharp ice edge of the snow, or in the killing of the cambium just above the snowline by reflected radiation. The sapstream rising in the wood encountered no hindrance, consequently the uninjured buds sprouted and started to grow, but the descending sapstream was interrupted at the place of the injury, and the spreading fungus infection, which quickly followed, soon blocked also the ascending stream. The collapse of the young growth followed unavoidably.

Leafing-out late and then only in part, usually leaving the topmost branches bare and dead, was caused by root-injury, which, naturally, is most likely to affect shallow-rooting trees, like *Cedrela, Cercidiphyllum,* etc.

Dying of the oldest shoots of ornamental shrubs, or the dying of shade trees on the lawn or of native trees in the woods, during the summer, was also caused by winter root-injury aggravated by the drought of the summer. In most cases it could be found that the trees which had suffered injury from this cause were growing in shallow soil, either actually on top of rocks or over impenetrably hard subsoil. Our oaks and hard maples are by nature deep-rooting trees, and if local conditions prevent them from sending their roots down as deeply as they must, in order to be safe from frost and drought, they are extremely subject to injury.

The feeding-roots of trees standing in the lawn are frequently attracted to the surface by surface-feeding of the lawn, which, likewise, renders them subject to winter injury.

The methods to prevent losses from these after-effects of a severe winter may be summed up as follows:

1. In the hard, frequently rocky subsoil, so prevalent in the vicinity of New York, trees, especially, wherever possible, should be planted in blasted holes. One-half stick of dynamite, inserted one and one-half to two feet deep, will loosen the subsoil sufficiently not only to give the plants a good start but also to assure their safety in later life.

2. Regular feeding of older trees, inserting the fertilizer in holes punched with a crowbar, will supply nourishment where it is most needed and will prevent the roots from coming dangerously near to the surface in their search for food.

3. Notoriously shallow-rooting trees and shrubs may be given a

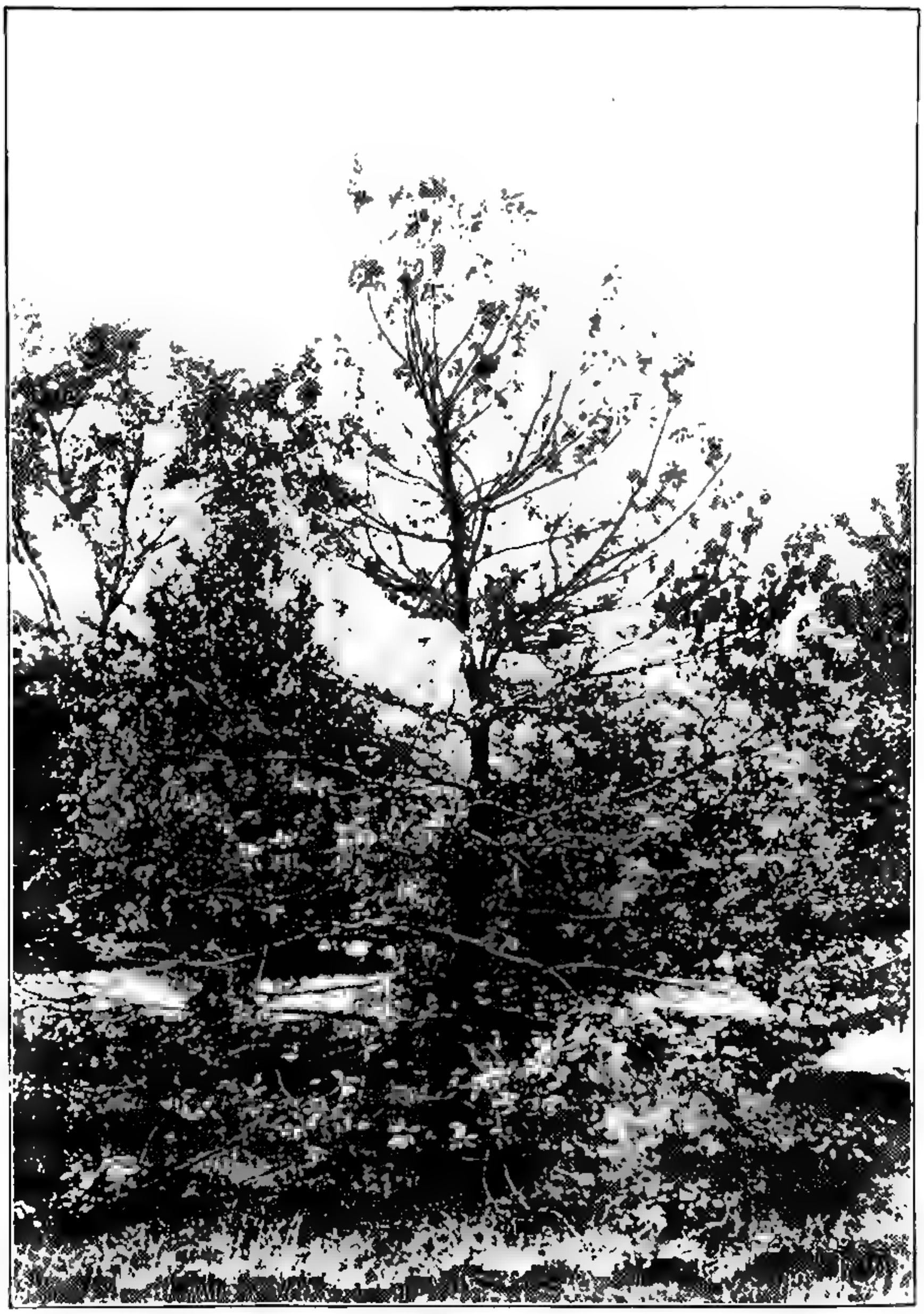

FIGURE 2. Oak tree (*Quercus Robur*) dying from drought and frost-injury to its roots. The stunted appearance of the tree—notice the abnormally thick base of the trunk—testifies to the absence of a taproot, which the tree has been prevented from forming by a ledge of solid rock extending under it at a shallow depth.

mulch of leaves in the fall and should never be planted all by themselves in exposed positions where their roots receive no shelter from other plants near by. The common practice of raking all the leaves out of the shrubbery in the fall, for the sake of tidy appearance, can be blamed for much winter injury which could have been avoided.

4. The importance of regular pruning of our flowering shrubs has been vividly demonstrated by the experiences of the past winter. It was very conspicuous that those shoots which died on our *Viburnum, Philadelphus,* etc., during the spring and summer were in most cases old and overgrown and should have been cut out several years ago. For many shrubs this type of winter injury brought a much needed rejuvenation and they will be the better off for it. If we make it a yearly practice to cut out of our ornamental shrubs all the weak and overgrown shoots, therewith giving young, vigorous growth a chance to develop, we need have little fear of the recurrence of this kind of winter injury.

5. After a severe winter it is even more important than normally to remember that woody plants need regular watering and feeding. Everybody realizes that a flowerbed and a vegetable garden need watering and feeding, but trees and shrubs only too frequently are left to themselves.

HENRY TEUSCHER.

COLLECTING SEEDS OF ALPINES FROM THE PEAKS OF THE WHITE MOUNTAINS

With the great increase in popularity of rock gardens in this country, it is noticeable how few of the native alpines are cultivated therein. In the White Mountains of New Hampshire are a number of peaks above timberline where many circumboreal plants as well as some endemic species grow, nearly all of which are worthy of cultivation, although they doubtless are difficult subjects. On the trip here described, taken in August, the writer, in company with Miss Caroline Romer, of Summit, and Mrs. Gladys P. Anderson, of Rahway, N. J., obtained seeds and seed-

lings of some of these plants, which will be tried out at The New York Botanical Garden.

Starting from Rutland, Vermont, we first made a brief excursion into Smuggler's Notch, which we knew to be one of the best natural habitats for *Polystichum Braunii* var. *Purshii*. We were pleased to see also a patch of *Asplenium viride*, the rare green spleenwort. Of special interest was a large colony of the mint *Blephilia hirsuta* in full flower near the southeastern outlet of the Notch. At various places, patches of a cream-colored form of *Impatiens pallida* were seen, as also the ever-present *Galeopsis Tetrahit*, its flowers of various colors, white with reddish spots, pure white, upper lip pink and lower lip white, and all pink.

Crossing the state we went over into New Hampshire to our real objective, the White Mountains, in the Presidential Range of which we planned to do collecting. Upon arriving, we heard the road up Mt. Washington was closed because of a snowstorm above timberline, so we decided to spend a while collecting on the lower slopes. The day was raw and cold, with frequent showers, the great ranges all being buried in the mists. We were told later that the temperature on Mt. Washington had dropped to 26° F. and that there was a two-inch fall of snow. The temperature to us in the valley had felt little more than that.

Exploring the lower slopes of Mt. Jefferson, where we first turned our attention, we noticed *Solidago macrophylla* and *Ibidium Romanzoffianum* in flower, and collected seed of *Trillium erectum, T. undulatum, Clintonia borealis, Streptopus roseus,* and *Actaea rubra*. On a little-used road on the lower slopes of the range we obtained seeds of the mountain-holly, *Nemopanthus mucronatus,* and bunchberry, *Chamaepericlymenum canadense,* and a few plants of *Pyrola secunda, Linnaea borealis* var. *americana,* and a strange orchid resembling a *Corallorrhiza* in its habit and fruits, but with green stems.

We then went over to the lower slopes of Mt. Washington and searched over the section between the carriage road and Huntington Ravine. In this section we collected seed of *Sisyrinchium angustifolium, Streptopus amplexicaulis, Chiogenes hispidula* and *Linnaea borealis* var. *americana*. We also found colonies of *Stachys palustris* and *Peramium tesselatum*.

Our long-awaited clear day arriving, we started up the carriage-

road to the summit of Mt. Washington. In the lower woods our only collections were *Lysias orbiculata* and *Pyrola chlorantha;* higher up we began to see occasional patches of *Ledum groenlandicum,* and upon reaching timberline the real alpines began to show up quite commonly. The first ones to become plentiful were

FIGURE 1. Smuggler's Notch, in the Green Mountains of Vermont, one of the most classical fern localities in the East. *Polystichum Braunii* var. *Purshii* was collected here.

Vaccinium Vitis-Idaea var. *minus,* with small shining leaves and bright red berries, and *V. uliginosum,* with dull, bluish leaves and blue berries; *Nabalus nanus, Arenaria groenlandica, Scirpus caespitosus,* and *Juncus trifidus. Aster acuminatus,* very common in the low valley woods, was the only aster to continue common up above timberline. *Solidago macrophylla* became replaced by *S. macrophylla* var. *thyrsoidea.* Soon afterwards these were augmented by the tight, round cushions of *Diapensia lapponica,* great quantities of *Sibbaldiopsis tridentata,* the heath-like *Empetrum nigrum, Vaccinium pennsylvanicum* var. *angustifolium, Solidago Cutleri,* and *Stellaria borealis.*

A short trip down the rocky slopes to the Alpine Garden was truly a revelation. In the dampish ground here, all the alpines

previously mentioned reached their best development. The most conspicuous of the great quantities of green cushions was *Salix Uva-Ursi,* and of showy flowers there were thousands of *Campanula rotundifolia* in full bloom, their violet-blue bells waving in the wind all over the damp slopes. Here also were numbers of plants of *Nabalus Boottii* in full flower, with large heads of quite showy white flowers; *Castilleja pallida* var. *septentrionalis,* its pale yellow bracts visible for some distance; *Houstonia caerulea* var. *Faxonorum,* white-flowered with a prominent yellow eye; *Veratrum viride,* and of course *Sieversia Peckii,* which, though endemic to the White Mountains and a few peaks in Maine, is nevertheless here very common in all moist or even partially moist situations, extending down the ravines even to timberline, its large, yellow, geum-like flowers forming a conspicuous feature of the damp areas. Everywhere, especially in the drier areas, were numbers of plants of *Rhododendron lapponicum* and *Loiseleuria procumbens* in seed, indicating that there had been a fine flowering season. In moist spots were splendid specimens of *Silene acaulis,* their pale-green cushions offering fine contrast to the prevailing darker greens. *Bistorta vivipara* was common here, its inflorescence consisting of a spike of bulblets in place of flowers. These bulblets, sprouting while still on the plant, are responsible for the specific name. Seeds were collected of all of the above which were ripe, as well as specimens. Other interesting plants present in quantity were *Juncus trifidus; Juncoides spicatum,* its nodding spikes of black capsules quite attractive; *Juncoides parviflorum, Scirpus caespitosus, Carex scirpoides, Trisetum spicatum* var. *pilosiglume,* and *Salix planifolia.*

It was interesting to note that the wild tumbles of rock above timberline were suffused with a peculiar yellow-green, caused by the growth of the lichen *Rhizocarpon geographicum,* which grows in great quantity upon the otherwise dull-colored rocks.

Arriving at the summit of Mt. Washington, we found the two hotels very crowded, but finally obtained bunks in the Tip-Top House for the night. Everyone was up early the next morning to see the sunrise, and before breakfast we wandered about a bit, finding on the geographic summit near the water-tower numbers of *Saxifraga rivularis* scattered among the boulders. Everywhere around were quantities of *Stellaria borealis,* and the white flowers

of *Arenaria groenlandica* seemed tucked into every nook available. Strolling down to the head of the Great Gulf we found numerous patches of *Salix herbacea,* in some places carpets of it. Far under the boulders in damp spots we found a number of plants of *Cardamine bellidifolia* var. *laxa* in full seed, while along the cog-railway were plants of *Leontodon Taraxacum* and *Ranunculus acris* in flower, obviously waifs from the lower levels.

FIGURE 2. Mt. Monroe in the White Mountains, viewed from the shoulder of Mt. Washington, showing a region known to botanists as one of the best collecting grounds for rarities in the Presidential Range. The whitish area at the left is the locality for two of the choicest plants found on the trip described here—*Potentilla Robbinsiana* and *Euphrasia Oakesii.* Toward the right foreground are the two Lakes of the Clouds and the A. M. C. hut.

The writer then went alone down to the Lakes of the Clouds, two rather small rocky lakes, situated in the notch between Mt. Washington and Mt. Monroe, their outlet forming the Ammonoosuc River, their rocky margins surrounded by quantities of the previously mentioned alpines. In addition to these, notably plentiful in this notch were *Betula glandulosa* and *B. glandulosa* var. *sibirica, Salix argyrocarpa* and *S. planifolia.*

The day was spent in collecting in this region and on the slopes

of Mt. Monroe, around the head of Oakes Gulf and across Bigelow Lawn to Tuckerman Ravine.

Near the head of Oakes Gulf at the base of the summit cone of Mt. Monroe is a small area of very loose orange-colored rock but sparsely scattered with starved-looking mats of *Salix Uva-Ursi, Loiseleuria procumbens, Rhododendron lapponicum, Diapensia lapponica,* and *Solidago Cutleri,* and studded with two- to three-inch-tall plants of *Campanula rotundifolia* with exceptionally large deep blue bells. In this peculiar area grow two of the greatest rarities of the White Mountains, *Potentilla Robbinsiana,* with yellow flowers, and *Euphrasia Oakesii,* with pinhead-size white flowers with reddish stripes and yellow eye. Both plants are about an inch tall and difficult to see, but finding them was a great delight. A number of seedling plants of *Rhododendron lapponicum, Loiscleuria procumbens, Diapensia lapponica, Solidago Cutleri,* and a few plants and seeds of *Potentilla Robbinsiana* were obtained at this locality. In damp spots filled with sphagnum nearby were found *Lonicera caerulea* var. *villosa, Kalmia polifolia, Ledum groenlandicum, Oxycoccus palustris, Veratrum viride,* and *Sieversia Peckii.* On higher slopes were quantities of *Solidago macrophylla* var. *thyrsoidea, Spiraea latifolia* var. *septentrionalis* and a form of *Streptopus roseus* with peculiarly angled berries. Several thickets of *Picea* and *Abies* about one foot tall were noted here also.

On Bigelow Lawn, *Empetrum nigrum* was of especially plentiful occurrence and in moist spots *Sieversia Peckii* and *Nabalus Boottii.* Nearly all the other alpines appeared also in abundance. Close to the head-wall of Tuckerman Ravine a number of hollows filled with water or sphagnum were noted, nearly all with east-facing ledges rising above them. The depressions were filled with a rank growth of *Veratrum viride, Solidago macrophylla, Sieversia Peckii, Nabalus Boottii,* and *Houstonia caerulea* var. *Faxonorum,* as well as *Betula glandulosa* and *B. papyrifera* var. *minor.* The crevices of the ledges above were filled with plants of *Phyllodoce caerulea,* appearing like tiny yew-trees, and covered with ripe seed-pods.

After enjoying an excellent supper at the Appalachian Mountain Club hut at the Lakes of the Clouds, just at twilight the writer made a sudden decision to ascend Mt. Washington and

inform the two ladies of the party of his intention of spending the night at the Lakes of the Clouds and joining them at Nelson Crag late the following afternoon. The summit cone of Washington was buried in mist, but the top was reached shortly after dark. After imparting the necessary information, he was informed, much to his chagrin, that the ladies, who had gone over to Mt. Jefferson, had found large quantities of *Cassiope hypnoides,* a plant he never did find.

By 10 p. m. the mist had increased so that vision was impossible more than a few feet ahead, but the descent was made to the A. M. C. hut nevertheless, and it proved to be a really enjoyable walk, even though at times it became necessary to halt and wait for a slight thinning of the mist in order to find the trail ahead.

The next day dawned misty and showery—fine collecting weather. A short trip was made down the Ammonoosuc Ravine to see how far down the alpines could be found. *Sieversia Peckii* extended slightly below timberline; *Diapensia lapponica* to timberline; *Arenaria groenlandica, Vaccinium Vitis-Idaea, Ledum groenlandicum* and *Kalmia polifolia,* below timberline; these were the plants especially noted.

The rest of the morning was spent around the head of Oakes Gulf, and then the trip to Nelson Crag was made, an interesting and rather spectacular one, because of the mist and frequent showers. Crossing Bigelow Lawn, the head-wall region of Tuckerman Ravine was again explored, but this time further down the head-wall. The water spots seen the day before became a brook in this region and in places around here were collected *Vaccinium caespitosum, Alnus crispa, Ribes prostratum, Limnorchis dilatata,* and *Aster puniceus* (a much-contracted form with hirsute stems and rather broad leaves). Many of the previously mentioned alpines were at their best development in this locality.

From here across Lion's Head to the Alpine Garden the path was through a "forest" of *Picea* and *Abies* 8–10 inches high, the tops flattened out and appearing as if clipped with giant shears. During this part of the trip not a soul was seen, though the air was constantly filled with the echoed voices of other hikers, invisible in the mist. In this section were collected specimens and seeds of *Ribes lacustre, Viburnum pauciflorum* and *Linnaea borealis* var. *americana,* which was also in flower. *Rubus triflorus,*

well-fruited with its acid red berries, was plentiful also in this section, a pleasant find, as it had been seen frequently in the valley woods, but not in fruit. Looking back across Tuckerman Ravine from here, one views the waterfall formed by the plunge of the above-mentioned brook over the head-wall and its course down the scree-slopes below into Hermit Lake just below timberline.

A different section of the Alpine Garden was now reached, where several small streams crossed the shoulder of the mountain. These streams had to be located by their sound, as they were half buried in the boulders and completely smothered in great tussocks of *Salix Uva-Ursi,* these tussocks in many places studded pin-cushion-like with *Sieversia Peckii* and *Campanula rotundifolia.* In several places where the growth was a little less dense, the inch-high plants of *Euphrasia Williamsii* with pinhead-size reddish flowers were dotted around everywhere, by the hundreds in some spots.

Upon reaching the head of Huntington Ravine, the writer turned off the trail to look into its depths, a long-to-be-remembered sight—the mass of shattered rock that formed the head-wall being barely visible, while from below great clouds of mist came boiling up into the air, swept upward by the winds, which now and then parted the mist to reveal jutting ledges of rock that seemed upthrust like the stone fingers of a drowning giant.

Climbing from here up to Nelson Crag, plants of *Arenaria groenlandica, Diapensia lapponica* and *Solidago Cutleri* were collected, and when the other two members of the party arrived, the return trip was made uneventfully. Going down through Franconia Notch, we stopped to look at the Old Man of the Mountains, afterward noting *Lobelia Dortmanna* and *Myriophyllum tenellum* growing in the shallow sandy edge of Profile Lake.

EDWARD J. ALEXANDER.

CHANGES IN FLOWER-BORDERS THIS YEAR AT BOTANICAL GARDEN

Borders that formerly were devoted to perennials, on the north and west sides of Conservatory Range 1, during the past summer have been planted to annuals and half-hardy perennials, providing a midsummer display which has continued through September, and promises to be attractive until frost.

To show that seeds of many annuals may be sown where they are to bloom, the entire west border was planted *in situ,* while plants in the two rows of beds bordering the path north of the conservatory were set out in June, after having been started from seed in the Propagating House. During most of the season, there was little difference in the appearance of the two sections, in a few cases the plants in the west border blossoming first.

Among the flowers which appeared in both borders were ageratum, zinnias, China asters, candytuft, sweet alyssum, larkspur, phlox, balsam, *Scabiosa, Hunnemannia, Calendula,* and *Tagetes.* California poppies were sown only in the west border, also *Anagallis grandiflora, Gypsophila muralis, Phacelia viscida, Mesembryanthemum criniflorum, Portulaca, Linaria,* and several others.

Among the plants which were set out only in the north borders were species of *Torenia, Lantana, Verbena, Antirrhinum, Papaver, Argemone, Petunia, Lobelia, Dianthus, Vinca, Gomphrena, Nicotiana, Gazania, Salvia,* and many others. The zinnias were especially fine throughout the middle of the summer, while in September the various Salvias, combining with brilliant Celosias, bronze Heleniums, and other flowers which had maintained their bloom throughout the lengthening season, continued to make the new borders among the show-spots of the grounds.

Meanwhile, 35 varieties of cannas, most of them new types, contributed by Henry A. Dreer & Company, of Philadelphia, have been blooming through August and September in a planting of more than 2,000 specimens just inside the Southern Boulevard entrance to the grounds, across the road from Fordham Hospital.

Later this month, the new border of hardy chrysanthemums will be in bloom beside the northernmost path near Conservatory Range 1.

CORRELATION OF THE ECONOMIC MUSEUM WITH THE HERBARIUM

The herbarium is preëminently the field of the specialist. A botanical necessity, in that all persons interested in plants in any way find it necessary to refer to it or its curators at times, this treasure-house is closed to most persons, through their inability to read its messages. It is to them like a city directory to which people turn for a name or an address, but which discloses little regarding the history, resources, and character of the population. Its marvelous revelations in geology, geography, biology, and general natural history are largely unrecognized because its difficult language has been mastered only by the few. All this is to say that it is not a popular resort, even for naturalists.

This, which might be called the educational handicap of the herbarium, was deplored during a symposium of the Botanical Society of America by Dr. Merrill himself, who referred especially to the fact that information concerning the economic uses of the plants is rarely given on the herbarium sheets. Recognition of this deficiency has oppressed me during all the time that I have had charge of the Economic Museum of this Garden. The Museum itself has fallen far short of the educational possibilities it might have under a system of labeling that would give more liberal information regarding the specimens and their economic values. Nevertheless, the collocation of the information represented by all the specimens derived from a given species, these remotely scattered through the Museum cases, would often tell a story of great interest, botanically, economically and often anthropologically. This collocation I long ago resolved to complete, but it was only comparatively recently that I was able to find the necessary time for doing so.

The specimens in the museum, approaching ten thousand, are grouped in the cases under the following classification:

	Numbers
Plant Hairs and Fibers	1– 722
Cork and its Products	723– 797
Paper Pulp	798– 843
Rubber and its Allies	844– 981
Varnish Resins	982–1187
Turpentine, Tars, and Pitches	1188–1262
Dye stuffs and Other Coloring Matters	1263–1323

Tanning Materials 1324–1395
Flavoring Agents, Condiments, and Spices 1396–1606
Waxes 1607–1617
Fixed Oils and Fats 1618–1703
Soap and Soap Substitutes 1704–1728
Volatile Oils and Perfumery 1729–2065
Fumitories and Masticatories 2066–2155
Beverages, including Chocolate 2156–2393
Proximate Principles or Plant Constituents 2394–2947
Starches 2948–3016
Sugars 3017–3104
Fodders 3105–3200
Foods
    Roots, Rootstocks, Tubers, and Bulbs 3201–3307
    Stems, Leaves, and Flowers 3308–3394
    Fleshy or Fresh Fruits 3395–4066
    Nuts, Dry Seeds, etc. 4067–4366
    Cereals and Other Grains 4367–4772
Drugs
    Underground Portions 4773–5116
    Barks (and Woods 5362) 5117–5380
    Leaves 5381–5629
    Herbs and Plant-bodies 5630–5868
    Inflorescences and Flowers 5869–5945
    Fruits 5946–6067
    Seeds 6068–6161
    Miscellaneous Drugs 6162–6315
    Plant Parts 6162–6177
    Resins 6178–6190
    Waxes 6191–6196
    Balsams 6197–6204
    Oleo-resins 6205–6214
    Gum-resins 6215–6228
    Gums 6229–6315
Poisonous Plants in the Vicinity of New York 6316–6427
Insecticides 6428–6448
Woods and Wood Products 6449–6992
Charcoals 6993–7069

The great majority of the species appear in more than one of these categories, often in a considerable number of them, and it is not practical to indicate, under each category, all the others in which the species appear. The idea occurred to me however, as entirely practical, of including all this information in a note attached to the herbarium specimen representing the species. During the past two years, this plan has been completely executed, every species in the herbarium that is represented in the Economic Museum now bearing the note "See Economic Museum, No. —." With the Museum Guide in hand, these numbers are instantly translated into references to the several economic uses. Taking, as an illustration ginger (*Zingiber officinale*), we find references in the Museum Guide under the following categories:

Nos. 1396 to 1404, Flavoring agents, condiments, and spices.
" 1793–1794, Volatile oils.
" 2177 to 2179.1, Beverages.
" 3235–3236, Foods.
" 4848 to 4856, Drugs.

While the chief purpose of these references is to supply economic information concerning the species, they not infrequently operate in the interest of the herbarium representation. For example, there are many cases in which the herbarium contains no specimen of a plant that is represented in the Museum. In these cases, a blank species sheet is placed in the herbarium, with a note referring to the Museum specimen, which can then be consulted for herbarium purposes. In many other cases, the specific name of a museum specimen is not known. In these cases, a herbarium sheet is inserted marked "X-sp." and the museum number is cited. One who is engaged in study in that genus is thus referred to additional material that may be consulted in the Museum. Finally, there are hundreds of cases in which herbarium material is entirely deficient in some part of the plant that should be studied, such as tubers, bulbs, or other underground portion, bark, wood, fleshy fruits or other parts too large to be attached to the herbarium sheet, and, in such cases, the references to the Museum may be of great assistance to the student.

H. H. Rusby,
Honorary Curator of the Economic Collections.

COURSES OF STUDY ANNOUNCED FOR 1934–35

Recognition of the trees and shrubs at different seasons and of the ferns in spring, and understanding, through actual practice, the elements of gardening, are the objectives of the year's courses of study announced last month by The New York Botanical Garden.

The instruction is offered to the public for a nominal fee. New York City school teachers are admitted in all but gardening subjects for half price; members of the Garden are given credit in all courses to the amount of their annual membership fee. Dr. Forman T. McLean is supervisor of the courses, the first one of which,

a study of trees and shrubs, began September 29. The opening session in the greenhouse course in gardening took place October 3.

Following is the schedule of courses announced for the year:

1—*Tree and Shrub Studies*—Field identification studies of our native and our commonly planted species in The New York Botanical Garden. 6 sessions. Saturday mornings, 9:30 a. m. to 12:30, September 29 to November 3, 1934. Fee $6.00. Half price to New York City teachers.

2—*Knowing Trees by Their Buds, Bark and Shape in Winter.* 10 sessions, Saturday mornings 10:30 a. m. to 12:30, January 5 to March 9, 1935. Fee $6.00. Half price to New York City teachers.

3—*Leaves and Flowers of Trees and Shrubs in Spring.* 6 sessions, Saturday mornings 9:30 a. m. to 12:30, April 20 to May 25, 1935. Fee $6.00. Half price to New York City teachers.

4—*Fall and Winter Gardening*—Practical gardening instruction and training in the proper handling of outdoor plants in fall and the management of house plants in winter. Wednesday mornings, 9:30 a. m. to 12:30, at the Propagating House. Greenhouse facilities are available during the classes. 10 sessions, October 3 to December 5, 1934. Fee $20.00.

5—*Our Native Ferns and Their Allies*—Outdoor studies at the Botanical Garden. 6 sessions, Tuesday afternoons, 4:00 p. m. to 6:00 p. m., April 30 to June 4, 1935. Fee $5.00.

6—*Spring Gardening,* under the direction of Dr. Forman T. McLean and the Gardening Staff of the Botanical Garden. 10 sessions of three hours each in practical gardening in greenhouse and outdoors. Plants are started in the greenhouse, grown by the members of the class, and taken to their own gardens in May. Fee $25.00.

a—*Introductory*—Deals with the elementary principles of gardening. Wednesday mornings, 9:30 a. m. to 12:30, March 20 to May 22, 1935, at the Propagating House.

b—*Advanced* -Special projects for people who have already completed the introductory course or its equivalent. Wednesday afternoons, 1:30 p. m. to 4:30 p. m., March 6 to May 15, 1935, excluding Flower Show week in March, at the Propagating House.

A MYCOLOGICAL FORAY

At the second annual foray of the Mycological Society of America, which took place at Seventh Lake, near Inlet, New York, August 21–24, The New York Botanical Garden was represented by Dr. and Mrs. R. A. Harper, Dr. and Mrs. B. O. Dodge, Dr. S. M. Pady, and Mr. Robert Hagelstein, the latter accompanied by Mr. Joseph H. Rispaud as field associate. The total attendance at the four-day gathering was close to seventy.

The group was divided into two sections, designated as the "parasites" and the "fleshies," both of which reported good success in finding specimens.

Collecting was done around Sixth and Seventh Lakes, Raquette Lake and its vicinity, and on Black Bear Mountain, which most of the party climbed. Among those who reached the summit were Dr. John Dearness, 84 years old, and Mrs. Dearness, who is 80. Dr. Dearness has long been an important contributor to the Garden's herbarium.

While Dr. Dodge brought back specimens of many of the pathogenic fungi, Dr. Harper's interest was divided between spot-diseases and the higher fungi. Dr. Pady also collected pathogens, especially rust parasites, but, unfortunately, his entire collection, with many of his personal belongings, was stolen on the return trip.

Mr. Hagelstein reports having found the region to be an excellent one for the development of the Myxomycetes. About 76 species were collected, among them several that have not been reported heretofore from the eastern United States, and others that require further study, as they have characters that may separate them from recognized species to which they have been tentatively assigned. At a stop made in Schoharie County, on the way home, six additional species were found.

The camp of Dr. F. C. Stewart, Plant Pathologist at the Agricultural Experiment Station at Cornell, was offered as headquarters for the foray, and, according to those at the Garden who attended, "Dr. Stewart outdid himself in making the whole trip pleasant and worth while."

BOOK REVIEWS

Recent Advances in Agricultural Plant Breeding[1]

The crop plants discussed in this volume are wheat, barley, oats, flax, potato, forage grasses, red clover, white clover, the roots (mangel, swedes, and turnips), the beverages (coffee, cocoa, and tea), sugar cane, citrus fruits, banana, tobacco, opium poppy, tropical cereals (maize, rice, and sorghum), rubber, fiber crops (cotton, sisal, New Zealand flax, and jute), and oil plants (cocoanut, oil-palm, castor, ground-nut, sesame, and soy bean).

There is a summary of the main facts regarding the development

[1] Hunter, T., and Leake, Hugh Martin. Recent advances in agricultural plant breeding. 361 pages, 16 plates. P. Blakiston's Son & Company, Philadelphia, 1933. $4.00.

of these crop plants and a statement of the economic, the agricultural, the environmental, and the biological factors involved in the breeding of them which have influenced the course of the improvement. There is an index of subjects, an index of authors, and at the end of each chapter a list of important references. In the preface the authors state that it was impossible for them to give a complete record for the crops discussed and that their aim is "to present in a connected form the results of only such investigations as have advanced beyond the limits of purely academic interest and the outcome of which has been the introduction of improved varieties into general agricultural use."

The authors have succeeded in making an excellent summary along the lines thus indicated. The volume is of value to plant breeders, to geneticists interested in practical results, and to horticulturists, and there is much information of interest to the layman.

A. B. STOUT.

USEFUL WILD PLANTS OF THE UNITED STATES AND CANADA[2]

Mr. Saunders has written an interesting book, which is here presented in a newly revised edition, wherein one may obtain a good idea of what the American Indians used for food, clothing, and medicine before the white man came. Many of these same uses of native American plants were learned by the early settlers and frontiersmen, and some are still in use in our more modern day. The methods of preparation given add zest to the text and one frequently is tempted to try some of the foods mentioned. Also, if one has any desire to try "rustling food" in primitive fashion, here is an excellent book to have on hand. It is a pity the book is not as thorough in its information about eastern plants as it is about western ones, as the interesting subject of primitive food plants in America has not yet been given adequate treatment.

EDWARD J. ALEXANDER.

[2] Saunders, Charles Francis. Useful wild plants of the United States and Canada. 275 pages, illust. Robert P. McBride & Company, New York. Third and revised edition, 1934. $3.00.

A GLANCE AT CURRENT LITERATURE[1]

New books on the library shelves at The New York Botanical Garden include "Trees and Shrubs of the Southeastern States" by William Chambers Coker and Henry Roland Totten, both of the University of North Carolina. The states of Virginia, North and South Carolina, and Georgia, and the northern part of Florida are covered in this new manual.

* * * *

Among other recent acquisitions are two volumes by A. W. Darnell, "Winter Blossoms from the Outdoor Garden," which is announced as "a descriptive list of trees, shrubs, and herbaceous plants that flower in outdoor gardens in the British Isles during the months of December, January, and February, for the use of amateur gardeners, alphabetically arranged," and a book on "Orchids for the Outdoor Garden," also, of course, for the British Isles.

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An outstanding work which the Garden has recently added to its library is an elaborately illustrated, 13-volume set of the *Flora of South Africa,* edited by I. B. Pole Evans, Director of the Botanical Survey of the Union of South Africa. This is, in reality, a bound magazine, each issue of which contains ten hand-colored plates accompanied by descriptions.

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Hand-colored plates by Mrs. Elinor F. Vallentin also embellish the "Plants of the Falkland Islands," another new acquisition. Descriptions are by Mrs. E. M. Cotton.

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Attractive, illustrated booklets on the national parks and monuments of the United States are being issued by the Department of the Interior. History, development, and natural features, including the flora of each region, are treated. The Library now has booklets on Yosemite, Grand Canyon, Glacier, Rocky Mountain, Yellowstone, Crater Lake, and Mount Rainier National Park, each in a different state, and on Death Valley National Monument in California.

[1] All publications mentioned here—and many others—are to be found in the Library of The New York Botanical Garden, in the Museum Building.

"Bulbs from Seed" is the title of a new, illustrated, 32-page leaflet by David Griffiths, published as Circular No. 311 of the United States Department of Agriculture.

* * * *

Shrubs which are suitable for the adverse conditions of city gardens are described by Alice Lindsley Dustan in the *Gardeners' Chronicle of America* for September. In the same issue, Ira N. Gabrielson tells how to plan and plant now for spring color, Cecile Hulse Matschat discusses ferns for all places, and Edgar T. Wherry treats the Sedums of the eastern United States, giving both popular and botanical descriptions.

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To aid in the identification of trees in winter, Dr. Harold D. Harrington, in "The Woody Plants of Iowa in Winter Condition," tells of the value of noting the habit, bark, twigs, leaf-scars, buds, bud-content, leaf-remnants, and fruit-remnants of each subject. Characteristics of each of these are included in his descriptions. The book is published as No. 1 of Volume XVI of *University of Iowa Studies.*

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Grapes peculiar to North America and certain northern blueberries are the subjects of Articles 4 and 5 of L. H. Bailey's *Gentes Herbarum.*

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Basing the study on about 600 plants collected in Sumatra by Walter N. and Catherine M. Bangham, The Arnold Arboretum of Harvard University has just published an enumeration of these plants, prepared by Dr. E. D. Merrill. The volume is No. VIII of the *Contributions* from the institution. Dr. Merrill designated 38 new species in the collection, of which 15 are illustrated. A nearly complete set of specimens has been deposited in the herbarium of The New York Botanical Garden.

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The exciting tale of the Henry family's exploration for plants in northern British Columbia, as told by the wife and mother of

the family, Mary G. Henry, is continued in the July *National Horticultural Magazine*.

Dwarf forms of pine are treated in this number in Arthur D. Slavin's series of illustrated articles on pines. Other plant subjects included in this issue are ivy, peonies, walnuts, hybrid hazels, eucalyptus, and seeds and seedlings.

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Two articles on flower-arrangement appear in *American Home* for September. Foundation planting is another important subject treated.

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The latest official publication on the Dutch elm-disease situation is Circular 322 of the United States Department of Agriculture, prepared by Curtis May, who is now in charge of the new laboratory for study and eradication of the disease, located at 2 Park Place West, Morristown, N. J. The author issues a plea for every one suspecting presence of the disease in a tree to send a pencil-size twig from a diseased branch to the headquarters in Morristown, accompanying it with information as to the appearance and location of the tree.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

Dr. Albert C. Smith, who has spent the last year collecting plants in the Fiji Islands, on a research fellowship from the Bernice P. Bishop Museum in Honolulu and Yale University, returned to New York September 1, and has now resumed his duties as Associate Curator at the Botanical Garden. Dr. Smith will describe parts of his trip and some of the interesting plants he collected in a forthcoming issue of the JOURNAL.

Mr. F H. Tai has come from the University of Nanking to The New York Botanical Garden to spend a year studying fungi under the direction of Dr. B. O. Dodge and Dr. F. J. Seaver. He plans to compile a list of Chinese fungi, and has brought with him a large collection of specimens. He is also interested in a study of the red rice-fungus.

Coming also from the University of Nanking, where he is an instructor in the College of Agriculture and Forestry, Mr. C. Y. Chiao spent most of August at the Botanical Garden, studying Chinese marine algae under Dr. M. A. Howe. He brought with him the largest collection of marine algae that has yet, so far as known, been made on the coast of Asia. Mr. Chiao is now on leave from his Nanking post to spend a year or more studying in this country. He is enrolled as a graduate student at the University of Wisconsin, and, besides his work at the Garden this summer, he also attended summer school at Cornell.

Miss Elizabeth Morse, Secretary of the California Mycological Society, has written that she is shipping to the Garden several hundred specimens of puffballs, accompanied by many photographs of species.

The Federated Garden Clubs of New York State, through Mrs. W. C. Meissner and Mrs. Carl L. Otto, both of Garden City, have presented to The New York Botanical Garden a valuable collection of about 95 species and varieties of *Sedum* and *Sempervivum*. These represent essentially the exhibit of living stonecrops, in the name of the Federated Garden Clubs, that elicited so much favorable comment at the International Flower Show in the Grand Central Palace in March, 1932. These interesting plants will be on display later in Conservatory Range No. 1 and in the new Thompson Memorial Rock Garden.

Dr. A. B. Stout spent several days in September at the State Experiment Station at Geneva, N. Y., in studies on the project of breeding for hardy seedless grapes. Very few of the large number of unprotected seedlings in the vineyard plantings were entirely killed during the severe winter of 1933–1934, he reported, but for most of them the fruit-bearing wood was killed. During the past summer new growth was vigorous, however, and all of the best seedlings selected for seedless or near-seedless fruit are now in excellent condition.

Miss Ellys Butler, who is studying at the Garden in preparation for a Doctor of Philosophy degree, brought back from Harvard,

where she spent a week under Dr. David Linder, several specimens of the Patellariaceae, the family she is monographing, for the Garden's herbarium.

Mr. H. H. Hume, Assistant Dean and Director of Research in the Florida Agricultural Experiment Station, at Gainesville, Fla., is spending a month at the Garden studying the genus *Zephyranthes.*

Dr. E. D. Merrill addressed a radio audience over Station WOR the afternoon of September 17 on "Eastern Asia as a Source of Ornamental Plants."

The following visiting botanists have registered in the library during the summer: Dr. Lyman B. Smith, Cambridge, Mass.; Miss Carrolle E. Anderson, Amherst, Mass.; Dr. E. H. Eames, Bridgeport, Conn.; Dr. George A. Garratt, New Haven, Conn.; Mrs. Ruth L. Van de Water, Hastings-on-Hudson, N. Y.; Miss Gemma Jackson, Prof. H. M. Fitzpatrick, and Prof. Charles Chupp, Ithaca, N. Y.; Dr. J. E. Spingarn, Amenia, N. Y.; Prof. H. W. Thurston, Jr., and Prof. Frank D. Kern, State College, Pa.; Messrs. C. V. Morton, L. C. Corbett and Egbert H. Walker, Washington, D. C.; Miss Lois C. Lillick, Cincinnati, Ohio; Prof. Dow V. Baxter, Ann Arbor, Mich.; Prof. and Mrs. L. R. Jones, Madison, Wis.; Miss A. Elizabeth Blagg, Grinnell, Iowa; Dr. Francis Drouet, Columbia, Mo.; Dr. Seville Flowers, Price, Utah; Dr. C. Th. W. Hamnarlund, Stockholm, Sweden; Dr. Charles Baehni, Geneva, Switzerland; Dr. Y. T. Chiu, Canton, China; Mr. C. Y. Chiao, Nanking, China; and Dr. E. Percy Phillips, Pretoria, South Africa.

Among other recent visitors to the Garden have been Dr. F. W. Foxworthy, retired chief research officer of the Federated Malay States, who was on his way to England; H. M. Coates, overlooker to the city gardens and recreations grounds of the city of Liverpool; F. A. McClure, professor of economic botany at the University of Lingnan; and Professor R. Kôketsu, of the Kyushu Imperial University at Fukuoka, Japan.

PUBLICATIONS OF

THE NEW YORK BOTANICAL GARDEN

Journal of The New York Botanical Garden, monthly, containing notes, news, and non-technical articles. Free to members of the Garden. To others, 10 cents a copy; $1.00 a year. Now in its thirty-fifth volume.

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THE NEW YORK BOTANICAL GARDEN

Bronx Park, New York, N. Y.

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THE NEW YORK BOTANICAL GARDEN
BRONX PARK, NEW YORK, N. Y.

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NOTES, NEWS, AND COMMENT

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A CENTURY-OLD AMERICAN HERBARIUM

A very interesting American collection of dried plants, more than a hundred years old, has recently been presented to The New York Botanical Garden by Mrs. Emma L. Oeder, of Ashland, Oregon.

It was not an heirloom, and the donor knew nothing of its history.* Fortunately, however, it contains abundant internal evidence of its original source.

The fly-leaf bears the name of David L. Coe, and the collection was certainly brought together by him. Even now, after a century, it comprises nearly 500 specimens, mounted in a large volume of 96 pages. A few are of cultivated plants, but nearly all are native in the regions where they were collected: eastern New York, adjacent New England, and Ohio.

Who was this David L. Coe? His name is unknown to the present generation of botanists. Yet here is his herbarium, nearly

*A subsequent letter from Mrs. Oeder explains how this herbarium came into her hands:

"Ashland is a small town, whose early settlers in '45 came from Connecticut, Pennsylvania, and New York. . The city dumps have afforded me a fruitful hunting ground, for sometimes really rare things have been sent out there, by descendants no doubt, who tired of caring for old things.

"On these city dumps is a very old lady. She pokes about collecting materials to sell. To her I have said ' . anything that looks old or curious, always lay aside and show me. .' One day she called my attention to this book, asking if I could use it.

"Every evening all burnable, waste material is destroyed upon the Ashland city dump, so you see that if 'Grandma's' watchful eyes had not salvaged the collection, the careful work of David L. Coe and Elias W. Leavenworth would have been burned and lost forever."

every specimen correctly named in accordance with the knowledge of his day; the common name usually added after the scientific one; the locality, habitat, and month of collection frequently noted. The specimens are of course small, as they must be to average five to a page, but they are well chosen to illustrate the characters of the plants, and are as good as are customarily found in herbaria of that period, when paper for mounting specimens was expensive and difficult to secure. There are no exact dates with the specimens, but as we shall see the herbarium was probably begun in 1817, and completed essentially as it now exists in 1822.

And now let us direct our attention to Williams College, in the year 1817, when that institution was less than twenty-five years old. Chester Dewey (1784–1867) had been on the faculty from 1808, and had held the professorship of mathematics and natural philosophy from 1810. His field was large, but he stressed botany, and was widely known as a student of the genus *Carex*. It was doubtless through his influence that Amos Eaton (1776–1842) was secured to give a series of popular lectures on mineralogy at Williams. Eaton was never a member of the faculty, but his magnetic personality made an astonishing impression upon the students. His services were secured to give a course of botanical lectures in the spring of 1817. But how was he to teach satisfactorily without a text-book describing succinctly the plants likely to be met with? No such work existed, so he prepared one, and this was published semi-anonymously, at Albany, the expense being borne by those who planned to attend the lectures. This was the first edition of "A manual of botany for the Northern States" which in seven subsequent editions up to 1840 was the most popular work in the field that had been opened by it. This first edition was prefaced by a dedication "to the author of Richard's Botanical dictionary" (Eaton), which was dated at Williams College, "8th April, 1817"; it was signed by every member of the senior, junior, and sophomore classes, and nearly all of the freshmen. There were 63 names in all, and among them we find "David L. Coe."

David Lyman Coe was born at Granville, Massachusetts, in 1795. Soon after his graduation, in 1818, he went to the "Western Reserve" in Ohio, where he taught in various schools. It was at Charlestown, Ohio, that he penciled on the fly-leaf of his herba-

rium, under his name, "Oct. 1822. This book contains about five hundred and forty-five species [of] plants." (There are still about 475, after the vicissitudes of a century, and many more may yet be salvaged, now lying loose between the leaves of the book.) He was pastor of the Presbyterian Church at Charlestown from 1828 to 1832, and then resumed his profession as a teacher, at Tallmadge, Ohio. He died at Richfield, Ohio, 20 July, 1836, at the early age of forty. But a large proportion of the plants in his herbarium were not collected by him. On page 47 he wrote this note:

"Nearly all the specimens from this page to the end were collected and presented to me by Mr. Elias W. Leavenworth of Great Barrington, [collected] during the years 182[0]–21 22 at Gt. Barrington, Williamstown and Newhaven. I hope ever to rem[em]-ber his generosity in present[ing] these specimens as well as for his many friendly attentions to me. D. L. Coe, Charlestown, Oct. 1822."

It is impossible to distinguish the Coe and Leavenworth collections with certainty, although many of the specimens bear collection-numbers which are probably all those of Leavenworth. Many of the finest and rarest specimens seem to have come from him, but they were evidently duplicates from his herbarium; one label shows that he had divided his meager material with Coe. Evidently his was no mere schoolboy collection, for it showed the same care in preparation and labeling and contained some greater rarities. In October, 1822, Leavenworth was not yet nineteen years old, but he had already come under the influence of Chester Dewey at Williams and Eli Ives (1779–1861) at Yale, both among the most eminent American botanists of that day.

Elias Warner Leavenworth was born at Canaan, Columbia County, New York, 20 December, 1803, but removed with his parents before his third birthday to Great Barrington, Mass., and this was his home until 1827. In 1820 he entered Williams College as a sophomore, and a year later entered Yale, where the standards were a trifle higher, again as a sophomore. It seems, therefore, that he was still an undergraduate when his gifts approximately doubled Coe's herbarium. He was elected a member of Phi Beta Kappa in 1823, and in the following year was graduated with the degree of B. A. He then began his law studies, and it was from this time, if not earlier, that his interest in botany was crowded

out; in fact, I have found no reference to his early botanical studies in any account of his life, even in the 18-page autobiography in his genealogy of the Leavenworth family (1873). He studied law with William Cullen Bryant (1794-1878) at Great Barrington, and at the Litchfield (Connecticut) Law School, and in 1827 went to Syracuse, New York, where he practiced his profession until 1850, and lived until his death. He was long one of the most honored citizens of Syracuse; president of the village twice, and later twice mayor of the city, member of the state legislature, Secretary of State of New York and one of the Regents of the State University, and for one term a Member of Congress. His great interest in parks and in the state geological survey may have resulted from his early studies in natural science. He died in Syracuse, 25 November, 1887.

And now a few words more about the herbarium. Many of the original specimens have been broken or torn from the strips with which they were mounted, apparently by careless handling, but there is little if any evidence of depredation by insects; this is perhaps explained by a note at the bottom of page 30: "From this page a mercurial preparation is used." Many of the specimens bear no indication of locality or habitat; frequently there are such annotations as "wet land," "side of the road," "pine woods," or "margin of a pond." Some are definitely placed, from the standpoint of the label-writer, but would now be unidentifiable, such as "Mrs. Gridley's," "Mr. Day's," "Burying ground," and "S. bay." Most of the plants collected by Coe himself seem to have come from Columbia County, New York, where I imagine that he must have lived while in college (Hudson, Claverack, Mount Washington—this last was the highest peak of the Taconic range, on the Massachusetts state line, not the famous mountain of the same name in New Hampshire), a number were from the Catskill Mountains (labeled Caatskill M., or C. Mount., or C. Mountains), and some from Charlestown (Ohio) and Burton (Ohio, not many miles north of Charlestown). Leavenworth's chief localities were Great Barrington, Sheffield, and Deerfield, all in western Massachusetts, and a few labeled "N. H." (New Haven, Conn., not New Hampshire). A few specimens that might have been collected by either Coe or Leavenworth are labeled "Williams College," "Mount Saddle" (now called Saddle Mountain, southeast of Williamstown), or

"Pownal" (north of Williamstown, just over the state line in Vermont).

Of course scattered specimens of plants collected in America at much earlier dates are to be found in various herbaria, but a collection such as this that has remained virtually intact since 1822 is certainly noteworthy.

JOHN HENDLEY BARNHART.

THE 1934 DAHLIA COLLECTION

The 1934 dahlia season may be considered to rank among the most successful of the seventeen in which the collection of dahlias has been a special feature at The New York Botanical Garden. July and August were a bit dry, but September brought nearly ten inches of rain. On some days the precipitation was heavier than was desirable and on two occasions the accompanying wind caused a considerable amount of breakage, but, on the whole, the copious September rainfall appeared to be distinctly favorable. The main collection, as in recent years, consisted of about 1100 plants, representing somewhat more than 400 varieties. In addition, the special bed of 160 essentially disease-free plants of two especially susceptible varieties, was maintained at a distance from the main planting. And numerous dahlias were to be found in the general flower borders north, east, and west of Conservatory Range No. 1.

The collection, as usual, continued to exhibit a few of the reliable old-timers, like the pompon Brunette (1885) and the cactus variety Countess of Lonsdale (1896), but the newer kinds, one to five years old, and a few not yet introduced to the trade, constituted the more conspicuous parts of the display. As is the case with irises, peonies, and roses, many of recent introduction represent little or no advance over the older varieties, yet a comparison of the leading varieties of 1934 with the favorites of 1914 or 1924 would show striking progress. Such a comparison indicates that the older varieties are being rapidly replaced by the newer ones. Of the 458 varieties grown at The New York Botanical Garden in 1924, only 20 persist in the collection of 410 kinds grown here in 1934. In the newer varieties increases in the size of the flower and in the strength of the stem have been attained and wonderful

Public Border of The New York Botanical Garden on Sunday afternoon, Oc-

new combinations of color are now exhibited. With the diameters of the flowers of certain varieties now reaching 16 or 17 inches, it would seem that there need be no further effort to produce bigger ones, but there is still a field for the development of vigorous disease-resistant varieties.

The balloting on Saturday and Sunday afternoons for the best-liked variety, initiated in October of last year, has been continued this season, beginning on the last Sunday of September. The favorites naturally vary with the progress of the season and the condition of individual plants at the moment. And it may happen that top-notch varieties, for one cause or another, may not be doing themselves full justice at any time during the whole season in our particular collection. The last Sunday afternoon in September, Pastel Glow, a large informal decorative, white, with an orchid-violet flush, was the favorite. The early and mid-October vote favored Adirondack Sunset, a scarlet informal decorative, usually with old-gold edges and backs. A close rival was Lord of Autumn, a large canary-yellow informal decorative. Other leading favorites were Spotlight, Snowdrift, Buckeye King, Ching, Goldene Sonne, Maryland's Glory, Monmouth Champion, Christmas Candy, Rainbow's End, Lugdunum Batavorum, King of the Blacks, Star of Bethlehem, Orchid Moonlight, Yankee Royal, Man o'War, and White Knight. The dahlias were killed by frost the morning of November 3.

For supplying roots and green plants of the newer and better kinds, the Garden is indebted especially to the following firms and individuals:

Dahliadel Nurseries, Vineland, N. J.; Success Dahlia Gardens, 171 Ferry St., Lawrence, Mass.; Sanhican Gardens, Trenton, N. J.; Albert Parrella, 3380 Ely Avenue, Bronx, N. Y. C.; Parkway Dahlia Gardens, 1012 E. 178th St.; Ruschmohr Dahlia Growers, 52 S. Kensington Ave., Rockville Center, N. Y.; William Meshirer, 43–55 Robinson St., Flushing, N. Y.; C. Louis Alling, 251 Court St., West Haven, Conn.; F. Ed. Spooner, Summit, N. J.; Dr. A. B. Scott, Fairmont, W. Va.; Golden Rule Dahlia Farm, Lebanon, Ohio; E. L. Kunzman, New Albany, Ind.; J. E. Hulin, 5964 24th Ave., S. W., Seattle, Wash.; A. A. Tower, Arlington, Wash.; A. G. Goodacre, Gardena, Calif.; Stephenson Dahlia Gardens, 2318 Hill St., Santa Monica, Calif.; Richard W. Petrie, Gardena, Calif.; Carl Salbach, 657 Woodmont Ave., Berkeley, Calif.;

FIGURE 2. A part of the Dahlia Border of The New York Botanical Garden, October, 1934. The two varieties most in evidence are Buckeye King (Peck, 1933) and Honor Bright (Peck, 1934). To

Alice Meussdorffer, 487 Hanover St., San Francisco, Calif.; N. Harold Cottam & Son, Wappingers Falls, N. Y.; John Toth, Fairfield, Conn.; W. J. Etherington, 125 Lexington Ave., Westwood, N. J.; A. H. Schlesinger, Rochelle Park, N. J.; Thomas L. Galvin, 4 Bedford St., Peabody, Mass.; Badetty Bros., Huntington, N. Y.; Edward A. Jehle, 9218–215 Place, Queens Village, N. Y.; W. E. Birrell & Sons, Summerville, Ontario; Vincent Sigismundi, 2 Manor Court, Teaneck, N. J.; F. A. Greenough, 25 French St., Braintree, Mass.; Salem Dahlia Gardens, 236 Grant St., Salem, N. J.; Frederick E. Dixon, Scotch Plains, N. J.; Supreme Dahlias, Tiverton Four Corners, R. I.; Chautauqua Dahlia Fields, Mayville, N. Y.; Walter Bissell, Austinburg, Ohio; Dr. H. Trossbach, Bogota, N. Y.; Valeria Home, Oscawana, N. Y.; Bertha Linduff, New Cumberland, W. Va.; Lee Cochran, 213 N. 8th St., Martins Ferry, Ohio; S. W. Smith, Port Jervis, N. Y.; L. N. Davis, Stoneham, Mass.; Fred Gresh, Zionsville, Ind.; Shelby E. Taylor, R. 3, Morgantown, W. Va.; Charles H. Smith, May's Landing, N. J.; and Mrs. J. C. Maxwell, Brevard, N. C. Mr. Stanley G. Ranger generously purchased roots of some of the newer English miniatures and mignons and presented them to the Garden. Interesting novelties were three Australian varieties presented by L. Fitzgerald, 35 Barrow St., Brunswick, No. 10, Victoria, Australia.

Besides the regular Saturday afternoon lantern-slide lecture on "Dahlias" in the Museum Building on September 29, there was a largely attended informal talk on the lawn in front of the Dahlia Border on Sunday afternoon, October 14. Informal talks were given also to visiting delegations from the Woman's Club of Port Chester on October 15 and from the Chappaqua Garden Club on October 17.

The New York Times published statements to the effect that the dahlias were seen by 5,000 people on September 30, by 10,000 on October 7, and by 9,000 on October 14. While these figures are doubtless exaggerated, it is a fact that the dahlias attracted the attention of thousands of admiring visitors on each of these Sundays and of smaller crowds on week-days. For the success of the 1934 Dahlia Border, the undersigned owes much to the helpful coöperation of Director Merrill, Horticulturist Thomas H. Everett, Foreman Gardener Patrick J. McKenna, and Miss Rosalie Weikert. For their devoted and efficient care of the plants great credit should be given to Gardener James Cahill and his volunteer assistant, J. Leslie Heitel.

MARSHALL A. HOWE.

WINTER INJURY OF HYBRID RHODODENDRONS

The hybrid evergreen rhododendrons of our gardens behaved last winter in a way that has been quite puzzling to many of their special friends. Here in the eastern states we are wont to consider a western or at least partly northern exposure as most favorable for evergreen rhododendrons. Last spring it could be observed, however, that in many instances rhododendrons flowered more satisfactorily in a southern than in a northwestern exposure, which seems to be in contradiction to all previous experience. But we have to consider that the past winter was abnormal in more than its extremely low temperature; and the blasting of the buds in northwestern exposure can readily be blamed on the strong and very cold northwest winds which we had to experience twice during February.

Even if this be taken into account, however, strange differences in the behavior of individual plants remain unexplained. These were most puzzling to those garden owners who did not realize that the varieties which made up their rhododendron groups were hybrids, and that they showed in their varying hardiness their varying affinity to their respective parents.

There are in particular six species which have been crossed and recrossed to produce our garden Rhododendrons, and these can readily be classified into two groups: (1) the hardy *R. catawbiense, R. caucasicum,* and *R. maximum,* and (2) the quite tender *R. ponticum,* the still more tender *R. arboreum,* and of late also the quite tender *R. Griffithianum.*

The hybrids among these which we have in our gardens are rarely straight crosses between two species, but are usually quite complicated. A combination like the following, for instance, is frequent: [(*catawbiense* × *arboreum*) × [(*catawbiense* × *arboreum*) × *catawbiense*]] × (*ponticum album* × *caucasicum*). There are four parent species involved in this cross, one of them three times, and one twice. If from such a complicated hybrid one collects seeds and raises plants from them, it can readily be imagined what will happen. Among the offspring some of the grandparents—or even more remote ancestors—will reappear almost pure; other plants are likely to combine in them undesirable traits of several of the in-

FIGURE 1. Two rhododendrons belonging to the same set of seedlings, each showing tenderness or hardiness, according to the ancestor from which it inherited these traits.

volved species. Their behavior, if they are exposed to a severe winter, will be according to their inherited qualities.

The accompanying picture shows this quite clearly. The two rhododendron plants in the foreground belong to the same set of seedlings, raised from the seeds of some hybrid variety. They are growing side by side in a nursery row under entirely identical conditions, and have been treated alike in every way. The conspicuous difference in their reaction to the severe winter can be referred only to their different genetic make-up, which, in this case, is quite evident also in their outward appearance.

The left plant resembles very closely *R. catawbiense* and, as the picture shows, has proved just as hardy. It is in full bloom, and not one of its flower-buds showed signs of injury.

The right plant looks very much like *R. ponticum* which, apparently, was one of the species used in the original cross. This plant shows the tenderness inherited from *R. ponticum* in its flower-buds, which were all killed during the past winter.

HENRY TEUSCHER.

ARISTOLOCHIA GRANDIFLORA

Aristolochia grandiflora is a tropical relative of the common Dutchman's Pipe (*A. macrophylla*). It is a native of several of the West Indian Islands and of northern South America and is remarkable because of the strikingly handsome flowers it produces. The peculiar shape of these earn for this species the common names of Pelican Flower, Swan Flower, Goose Flower, and Duck Flower, all names suggested by the resemblance which the unopened buds bear to the body and head of a bird.

The flowers are large, with a curiously curved and inflated tube, which expands into a heart-shaped limb several inches in diameter. From this limb depends a long twisted ciliate tail. The showy part of the flower is really the petaloid calyx for, as in all Aristolochias, the corolla is wanting. In color the flowers are creamy-white, attractively reticulated and blotched with purple and towards the center and in the throat becoming a rich vinous-purple self. They remain expanded for only about forty eight hours and during the earlier part of this period emit a most disgusting odor, which is said to attract carrion-loving insects.

FIGURE 1. The pelican-flower, *Aristolochia grandiflora,* in bloom.

Aristolochia grandiflora is rarely seen in cultivation and a plant bloomed for the first time at the Garden in mid-October. This specimen was raised from seeds received from the Botanic Garden at Copenhagen, Denmark, eighteen months ago, and the flower produced measured more than seven inches across and had a tail eleven inches long.

The cultivation of the tropical Aristolochias presents no particular difficulties. They are readily raised from seed or from cuttings of young growth taken in the spring. The plants thrive in a well-drained, loamy soil, in a greenhouse where a winter minimum temperature of from 58 to 60 degrees is maintained. Full exposure to sun is desirable and during the growing season they should be sprayed freely with clear water. Well-established specimens benefit from regular feeding with liquid organic fertilizers. Although in its native state *Aristolochia grandiflora* is a woody climber, it is advisable under greenhouse cultivation to prune the plants severely each spring and train up the annual shoots which will produce flowers in the late summer and fall.

T. H. Everett.

THE REPUBLICATION OF FUNDAMENTAL BOTANICAL WORKS OF JAPAN

The botanical public is under obligations to Professor T. Nakai for his interest in furthering the republication of various fundamental works pertaining to the flora of Japan. These are being republished by the offset process and are hence exact reproductions of the originals. They are printed on excellent paper and are well bound.

Among those already issued are Thunberg's Flora Japonica (1786), issued by Inoue Shotan, Morikawa-Cho, Tŏkyŏ, in 1933; Thunberg's Icones Plantarum Japonicarum, five parts, 1794–1805, issued by Syokubuth Bunken Kankokai, 4 Kobikichiyo, Kyobashiku, Tŏkyŏ, Japan. Other publications that have similarly been reproduced are Siebold & Zuccarini: Flora Japonica (1843–46), and Siebold: Synopsis Plantarum Oeconomicarum (1827). Plans are now being perfected for similarly reproducing the first edition of the fundamental Linnaeus' Species Plantarum, and various papers pertaining to the Japanese flora written by Thunberg.

The original editions of all these publications are long out of print, many of them are exceedingly rare and expensive, and are hence not available to numerous individuals who need to have access to them. These modern offset reproductions, now being published in Japan at nominal rates, will enable many botanists and botanical institutions, not only in Japan but elsewhere, to acquire copies of these fundamental works at nominal cost.

This project is financed by an anonymous Japanese patron of science as a service to Japanese botanists.

E. D. MERRILL.

YEAR–BOOK OF AMERICAN AMARYLLIS SOCIETY

The American Amaryllis Society was organized in 1933 with the object of promoting interest in Suborder I, Amarylleae, and Suborder II, Alstroemerieae, Order Amaryllideae (Baker, J. G., Handbook of Amaryllideae, 1888).

In February of the present year the Society published its first year-book, a very creditable production of 106 pages, well printed and carefully edited. This year-book contains, in addition to the constitution and by-laws of the Society, a reprint of the keys to the genera of Suborder I—Amarylleae, Suborder II—Alstroemerieae and the species of the genera *Hippeastrum* and *Amaryllis* according to Baker. A preliminary check-list of horticultural varieties of *Hippeastrum* and a number of important articles dealing with the breeding and hybridizing of Amaryllids, their culture and the insect and fungoid pests to which they are subject, are also included.

The group of plants to which the American Amaryllis Society devotes interest comprises 54 genera and is of great importance horticulturally. It would seem that the society can be of very real service to growers and fanciers of these subjects.

The year-book is apparently available only to members of the Society. Annual dues are $2.00. Wyndham Howard, 2240 Fairbanks Avenue, Winter Park, Florida, is Secretary.

T. H. EVERETT.

TWO AGED EPIPHYTIC ORCHIDS

On one of our collecting trips to the lower Florida Keys in 1928, two prodigious plants of a native epiphytic orchid were found, growing on an island east of Key West. The locality was a small hammock near the ocean front. The size of the plants may be realized from the fact that a family of raccoons occupied the top of each for a nesting place. Each plant or colony consisted of approximately twelve hundred green pseudobulbs. How many pseudobulbs had naturally died and dried up during the life of the colonies we do not know. As the multiplication of pseudobulbs is apparently a slow process, one may assume that a colony of twelve hundred represents a considerable age.

FIGURE 1. A very old plant of *Encyclia tampensis* composed of about 1200 pseudobulbs. The flowers are of a yellow ground-color with markings and splotches of purple and brown on the sepals and petals.

During the season following the bringing of the plants to the Garden they flowered while hanging from the rafters in Conservatory Range number 2. Several hundred flower stems on each plant bloomed simultaneously, each stem bearing from three to eight mainly yellow flowers with some of the parts marked with brown and purple. The accompanying photograph of one side of one of the plants in flower will give an idea of the plant in the flowering stage. Furthermore, this orchid, *Encyclia tampensis*, normally flowers once a year, but these plants for some reason flowered in a desultory way out of season.

JOHN K. SMALL.

A GLANCE AT CURRENT LITERATURE[1]

In "The Iris' Near-of-kin" in the *Gardeners' Chronicle of America* for October, Claire Norton describes many plants which are said to be fascinating even to the amateur grower, but too infrequently seen. In the same number, Edith H. Banghart explains what she calls the "moraine or scree idea," by which certain rock garden plants are made to thrive by allowing their roots to reach cool moist earth.

* * * *

Although "Common Weeds" by Paul C. Standley, published as *Botanical Leaflet 17* of the Field Museum, refers directly to the Chicago region, the contents of the booklet are applicable over a much wider area.

On the strictly scientific side, Mr. Standley has lately produced "The Flora of Barro Colorado Island, Panama"—a manual whose descriptive introduction fires both scientist and traveler with a desire to start at once for this fascinating isle in Gatun Lake. It appears as *Contributions from the Arnold Arboretum—V*.

* * * *

The October *Bulletin of the Horticultural Society of New York* announces that the afternoon and evening meetings this season will take place the same day of each month—the third Wednesday—to enable out-of-towners to attend both sessions during one trip, and

[1] All publications mentioned here—and many others—are to be found in the library of The New York Botanical Garden, in the Museum Building.

also to enable those at the evening meetings to see at least part of the afternoon floral display.

* * * *

In the test garden for new roses, which was revived this year under the auspices of the American Rose Society in Elizabeth Park, Hartford, Conn., 148 plants were under observation. These represented, according to the *American Rose Magazine* for September–October, 17 originators from America, France, Spain, Belgium, and Holland, and included 18 American roses.

* * * *

Sweet Corn is the subject of Part 3 of Volume 1 of *Vegetables of New York,* being published by the State Agricultural Experiment Station. The present part, which contains, besides magnificent colored illustrations, sections on the history and systematic botany of maize, its development, and complete descriptions of varieties, has been prepared by William T. Tapley, Walter D. Enzie, and Glen P. Van Eseltine.

* * * *

From May 15 to July 1 is the most desirable time to scout for the Dutch elm-disease, according to the September *Nursery Disease Notes* of the New Jersey Agricultural Experiment Station. Lack of funds, the article points out, has kept many diseased trees standing (1600, for example, in New Jersey). These should be removed before April 1, 1935, it emphasizes, if control is to be successful.

* * * *

A convenient table for planting twenty kinds of bulbs for the winter window garden is given in *Horticulture* for September 15.

* * * *

Two articles on fall and winter decoration, in which wild plants are principally used, are included in the October *Flower Grower.* Rex D. Pearce contributes to that issue an article on the autumn wild flowers of New Jersey, and Carleton Yerex "A Critical Consideration of Hybrid Lilies."

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

We much regret to record the death of Mr. Kenneth Kent Mackenzie, which occurred at his home in Maplewood, N. J., on October 22, at the age of 57 years. He was a member of the Board of Managers of The New York Botanical Garden since 1923 and for several years was one of its executive committee. A lawyer by profession, Mr. Mackenzie had won distinction among botanists as an authority on the genus *Carex*.

Dr. A. B. Stout spent several days during the autumn in Maine with Dr. E. J. Schreiner in an inspection of the nursery and the experimental plantings of poplars established by the Oxford Paper Company. About 10,000 seedling poplars, obtained by hybridization, have now had eight years of growth in a forestation planting and several have already flowered.

Dr. H. A. Gleason has been appointed to the National Research Council for Biology and Agriculture for a period of three years.

Dr. and Mrs. Agesilau A. Bitancourt, of Sao Paulo, Brazil, visited the Garden late in September while spending a few days in the United States on their return from Europe. Dr. Bitancourt, who is subdirector of the Instituto Biologico at Sao Paulo, has been inspecting Brazilian fruit in European markets.

Dr. P. A. van der Bijl, professor of plant pathology and mycology at the University of Stellenbosch, South Africa, who has been visiting laboratories of phytopathology and mycology in the United States, was a caller at The New York Botanical Garden on October 8.

Dr. E. D. Merrill addressed an audience at the Brooklyn Institute of Arts and Sciences the evening of October 16 on plant life of the Philippines.

A large exhibit of wild flowers of Long Island, prepared by The New York Botanical Garden, was awarded a special prize at Brooklyn's Fall Flower Show, held in the Fourteenth Regiment Armory, September 25 to 29.

The tall sugar-palm from Malaysia, *Arenga pinnata* (*A. saccharifera*), which has been growing in Conservatory Range 1 for about 25 years, until it now reaches the top of the 90-foot dome, began blooming for the first time in September this year. A second inflorescence appeared in October, and more will appear in sequence for a year or more, it is expected, each from the next lower leaf-axil.

In the production of the small greenish flowers, which are like beads along pendent branches about three feet in length, great quantities of starch which has been gradually stored in the trunk are utilized. So, after the fruits are produced, the entire tree dies.

The inflorescences, which yield an abundance of sap when cut, are an important source of palm sugar in the Orient.

Soon after this palm began blooming, the Illawarra palm, *Archontophoenix Cunninghami*, from Australia, which has been growing in the same house, put forth a tassel of rose colored flowers, which hang from a point on the trunk about three feet below the lowest leaf.

Announcement is made that Norman Taylor, editor for botany of the new Webster's Dictionary, has been engaged by Houghton Mifflin Company as editorial and promotion advisor in the field of garden books and others in the realm of natural science and outdoor life. With Mr. Taylor's coöperation the publishers contemplate more active publication of books on gardening, flowers, insects, geology, exploration, and kindred subjects, including tree books and forestry. He will carry on his work at the New York office of Houghton Mifflin Company. Mr. Taylor was formerly Assistant Curator of The New York Botanical Garden and later Curator of Plants at the Brooklyn Botanic Garden. He is the author of the "Flora of the Vicinity of New York: a Contribution to Plant Geography," which constituted Volume V of the Memoirs of The New York Botanical Garden.

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Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, tulips, lilacs, irises, peonies, roses, lilies, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical literature, comprising more than 43,500 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the year.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. It possesses now nearly two thousand members, and applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
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All requests for further information should be sent to

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PLANT COLLECTING IN FIJI
A. C. SMITH
STUDENT-GARDENER TRAINING
T. H. EVERETT
GOLD MEDAL FOR FOOD-PLANTS EXHIBITED AT FALL FLOWER-SHOW
BEQUEST FROM THE WILL OF K. K. MACKENZIE
LECTURES SCHEDULED FOR THE WINTER MONTHS
NOTES, NEWS, AND COMMENT
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PLANT COLLECTING IN FIJI

Of Pacific Island groups, Fiji probably presents the most interesting problem to the botanist, lying as it does in eastern Melanesia in the path of plant migration from southeastern Malaysia into Polynesia. Botanical collectors have realized the strategic importance of the group, which nevertheless has not received the attention it merits. The first extensive collection was made by Brackenridge, Pickering, and Rich, members of the United States Exploring Expedition in 1840. These collectors were followed by McGillivray and Milne, who accompanied the ship "Herald" in 1856. But by far the most important early work in the group was done by Seemann, who in 1860 collected on Lakemba, Taveuni, Vanua Levu, Ovalau, Viti Levu, Kandavu, and a few smaller islands. The results of his collecting and that of previous investigators were published in a work[1] which is still the only comprehensive one on the flora of Fiji.

Since Seemann's time few collectors have worked in Fiji. Among them should be mentioned Horne, whose semi-popular account[2] gives considerable information concerning the plants. Sir Everard im Thurn, in 1905–1907, made collections on Viti Levu and Kandavu, some of which have been described.[3] In 1907 Lillian Gibbs[4] collected in the montane regions of Viti Levu. In 1924 several hundred herbarium specimens were collected on the islands

[1] Seemann, A. B. Flora vitiensis. i–xxxiii, 1–453, *pl. 1–100*. 1865–1873.

[2] Horne, J. A year in Fiji. 1–297, *map*. 1888.

[3] Turrill, W. B. A contribution to the flora of Fiji. Journ. Linn. Soc. Bot. **43**: 15–39. 1914.

[4] Gibbs, L. S. A contribution to the montane flora of Fiji. Journ. Linn. Soc. Bot. **39**: 130–212, *pl. 11–16*. 1909.

of Lau, as the eastern group of Fiji is known, by Mr. E. H. Bryan. Recently, very valuable field work has been done by Mr. H. E. Parks, of the University of California, and the late Dr. J. W. Gillespie, whose excellent work towards a flora of Fiji was cut short by his untimely death. Some of the results of their collections, made on Viti Levu, Ovalau, and Taveuni, have been published.[5] Many residents of Fiji have recently made small collections among which interesting plants have been noted. The field work of Dr. J. D. Tothill and Mr. W. Greenwood has disclosed unusual plants.

In order that work on a comprehensive flora of Fiji might proceed, it was deemed necessary that additional herbarium material be assembled, particularly from the interior of Vanua Levu and from some of the smaller islands not previously visited by a botanist. The opportunity to continue the work of Dr. Gillespie was offered the writer, who, as a holder of a Bishop Museum Fellowship in Yale University, spent nine months in the group in 1933–34.

On August 31, 1933, I left New York for Honolulu, where, at the Bernice P. Bishop Museum, I spent ten days gathering an outfit and discussing Fiji with members of the staff. I am particularly indebted to the Director, Dr. H. E. Gregory, and the Curator, Mr. E. H. Bryan, for their generous information concerning Fiji. It was suggested that I should not duplicate the work of Parks and Gillespie by collecting in the regions of Viti Levu visited by them, but should concentrate on those parts of Fiji as yet unvisited by a botanist. Arriving at Suva, the capital town of Fiji, on October 3, I discussed the situation with many residents whose valuable local knowledge is indispensable to a visiting scientist. In particular I wish to acknowledge the aid of Mr. A. L. Armstrong, Secretary for Native Affairs, Mr. Allport Barker, Mr. George Barker, and the officials of Morris, Hedstrom, Ltd.

The Crown Colony of Fiji, comprising about 250 islands, lies between latitude 15° and 22° south and between longitude 177° west and 175° east. The total land area is about 7,000 square miles, of which the two principal islands, Viti Levu and Vanua Levu, occupy more than 6,000. Next in size are the islands of

[5] Copeland, E. B. Ferns of Fiji. B. P. Bishop Mus. Bul. **59**: 1–105, *pl. 1–5*. 1929. Gillespie, J. W. New plants from Fiji (I). B. P. Bishop Mus. Bul. **74**: 1–99, *f. 1–57*. 1930; (II) **83**: 1–72, *f. 1–40*. 1931; (III) **91**: 1–81, *f. 1–43*. 1932.

Taveuni, Kandavu, Koro, Ngau, and Ovalau. The highest elevation in the group is attained by Tomanivi (Mount Victoria) on Viti Levu, at about 1,300 meters. The larger islands are volcanic in origin, but many of the smaller ones are formed of upraised limestone. The two types of soil thus formed support very different floras, a fact which is apparent to every traveler.

My first field trip was to Kandavu, a very fertile island lying about 60 miles south of Viti Levu. Approaching Kandavu on one of the small cutters used to transport copra and bananas, one per-

FIGURE 1. *Barringtonia speciosa,* a common tree of the seacoast.

ceives a long rugged land culminating at the western end in a beautiful rounded peak, Mount Mbuke Levu (825 meters). At one point, between Namalata and Ngaloa Bays, the island is only a mile across. In this region I spent ten days, making collections in the neighboring low hills. The lowland vegetation is more or less similar throughout the group, made up of species which as a rule are pan-Pacific. Except in dry regions, the ubiquitous coconut is seen on every hand near the coast. The shore of Kandavu is marked by many long beaches, protected by fringing or barrier reefs which provide anchorage for small boats. The littoral vegetation throughout the group varies but little; one notices such trees as Ndilo

(*Calophyllum inophyllum*), Mulomulo (*Thespesia populnea*), Vutu (*Barringtonia speciosa*), Mbuambua (*Guettarda speciosa*), Ndrala (*Vitex trifolia*), Tatanggia (*Acacia laurifolia*), and Nawanawa (*Cordia subcordata*). The most common shrubs are perhaps Vau (*Hibiscus tiliaceus*), Yanggoyanggona (*Piper Macgillivrayi*), and *Scaevola frutescens*. In places where silt is washed out from the land, narrow belts of mangrove swamp occur. Mangrove swamps are more highly developed at the mouths of rivers on the two large islands, especially on the delta of the Rewa on Viti Levu. The principal trees in these swamps are Tiri (*Rhizophora mucronata*), Ndongo (*Bruguiera conjugata*), Sinu (*Excoecaria Agallocha*), Ndambi (*Xylocarpus Granatum*), and Sanggali (*Lumnitzera littorea*). The many villages of Kandavu are built on the narrow coastal strip, behind which volcanic hills rise with some abruptness. Seemann has remarked that Kandavu, which at one period must have supported a very large native population, is practically cleared of virgin forest except for the summit of Mbuke Levu. But the secondary forest, where it has been permitted to reclaim the rugged interior, is made up of essentially the same constituents as the original forest, and has now attained density and luxuriance.

The most interesting part of the island, both scenically and botanically, is the western extremity. An abrupt spectacular headland, Cape Washington, protects the little village of Mbukelevuira, which was my headquarters for a week. The village is fairly typical of Fijian coastal towns, consisting of a rough green which serves the natives as a cricket and football field, surrounded by twenty or thirty houses of all styles. Unfortunately, in coastal towns on the large islands the picturesque native houses are being supplanted by crude and ugly wooden shacks with roofs of corrugated iron, although the chiefs and some others still build their houses of native materials. The Mbuli, or chief, of Mbukelevuira is very proud of his three Fijian houses, into which excellent workmanship has been put. The most important timbers for housebuilding in this part of Fiji appear to be Vesi (*Intsia bijuga*) and Mbuambua (*Guettarda speciosa*), while the caudices of a tree fern, Mbalambala (*Cyathea lunulata*), are used as secondary uprights. The frame is covered by a network of reeds, and the roof is generally thatched with leaves of the same plant, known as

Ngasau (*Miscanthus floridulus*). The walls are thatched either with reed or palm leaves, and covered without by the leaves of Makita (*Parinarium glaberrimum*).

Behind the village rises the impressive mass of Mbuke Levu, its summit by day usually truncated by billowing white clouds, but on moonlight nights sharply outlined against the pale sky. The mountain's precipitous slopes support a dense and varied vegetation, among which such trees as Yasiyasi (*Eugenia* spp.), Sikau (*Gnetum Gnemon*), Male (*Myristica* spp.), and Ndanindani (*Nothopanax* spp.) are frequent. Towards the summit the forest is perpetually wet from clouds, so that the trunks and branches of trees are covered with mosses and lichens. Among epiphytes, the beautiful orange flowers of the orchid *Dendrobium Mohlianum* catch the eye, and the equally impressive scarlet blossoms of the parasitic *Loranthus vitiensis* demand attention. The most attractive low woody plants are species of *Cyrtandra* and *Uragoga,* both of which bear large cream-white flowers among their glossy leaves. Everywhere ferns abound, species of *Asplenium, Diplazium,* and *Selaginella* carpeting the wet floor, while epiphytic filmy ferns and the climbing *Oleandra Parksii* cloak the trees.

Being especially interested in the island of Vanua Levu, which is more than three times the size of Oahu, I spent the month of November there, and revisited it for nine weeks in April, May, and June. Seemann and Horne both collected on this island, but the interior is not easy of access, and until the present we have had practically no herbarium material from the wet mountainous regions. Lying east and west, that is, athwart the prevailing southeast winds, the long narrow island presents an excellent study in the influence of moisture on vegetation. The southern and eastern slopes receive a heavy rainfall, principally during the summer (November to May), but rains are also frequent during the remainder of the year. The northern slope of the island, however, receives practically no rain during the six winter months. Consequently this slope is a reed country, covered for miles by *Miscanthus floridulus* and associated species. Here and there occur thickets of small trees and shrubs, among which may be mentioned Molau (*Phyllanthus* spp.), Kalambuthi (*Acalypha insulana*), Ndoi (*Alphitonia excelsa*), Vasa (*Cerbera Manghas*), and Lauthe

FIGURE 2. A forest camp on the slope of Mount Seattura, at 500 meters elevation.

(*Aleurites moluccana*). Northwestern Vanua Levu, in the dry zone, was the home of the famous Fiji sandalwood or Yasi (*Santalum Yasi*), which is now seldom seen mature in its natural habitat.

The wet side of the island naturally supports a much more varied flora, offering numerous variations of slope and exposure. A steep mountain range is nearly continuous the length of the island, and by ascending this from the coast in many places I was able to obtain a fairly complete picture of the wet forest. During the course of my visits I collected on the slopes and summits of the following mountains: Mbatini (1,030 meters), Ndikeva (940 m.), the Korotini Range (925 m.), Mariko (867 m.), Seatura (830 m.), and Uluingala (820 m.). This list includes all the Vanua Levu hills higher than 750 meters except Valili, where Horne has collected.

Since these mountains are somewhat similar in the general aspect of their vegetation and in their degree of accessibility, I shall describe the ascent of only one, Mbatini. In order to reach this peak and the neighboring Korotini Range, I established headquarters in the little village of Vatukawa, about four miles inland from Savusavu Bay in the Ndrekeniwai valley. Living in such a town, of perhaps a dozen houses, is very pleasant indeed. The natives away from the coast and less exposed to European influences still retain many of their old customs, among which hospitality to visitors is paramount. The Turanga ni koro, or headman, placed a house at my disposal, and supplied me with food during my stay. Throughout the trip I retained one Fijian as a head boy, and in every village he readily obtained whatever extra boys we needed. After collecting in the vicinity of Vatukawa and on the Korotini Range, we started one afternoon towards a camping site at the foot of Mount Mbatini, with half a dozen boys to carry camping equipment and to bring back the specimens. About two hours above Vatukawa we passed through the small village of Nukumbolo, which is known for its hot springs. Proceeding upstream along a native track which leads to Lambasa on the north coast, before dark we found, beside a rushing stream, a level space which the boys soon cleared. They set up my canvas fly and built for themselves a shelter of leaves. The nights in

the mountainous regions, if one is fortunate enough to avoid a rainy spell, are delightfully cool and free of troublesome insects. We bathed in the swift cold stream and made a supper of prawns, breadfruit, and Ndalo (*Colocasia antiquorum*) around an open fire. Then some of the boys sang, not unharmoniously, until we were ready to sleep. The night was brilliant with moonlight, and from the dense surrounding forest arose a chorus of insect voices.

The next morning at dawn, breakfast being disposed of, we started toward the summit. Our camp was at the foot of a steep buttress leading towards the main crest, the whole region being very heavily forested. Following the crest of the buttress, we discovered many trees and shrubs new to my collection. The natives are keen woodsmen, their sharp eyes picking out flowering trees for me. While two or three went ahead to clear a passable track, the rest of us followed slowly, felling trees when necessary and assembling material. When my collecting portfolio had been filled several times, we left the packages of plants in a copra sack hanging on a tree, to be recovered on the way down. On Vanua Levu the predominant tree in forest below 500 meters is apparently the Masivau (*Girroniera celtidifolia*). This is the only tree I have observed in anything approaching pure stands. For the most part, however, it is associated with such other woody plants as *Ficus* spp., Vatambua (*Hedycarya dorstenioides*), Male (*Myristica* spp.), Mbatho (*Cinnamomum pallidum*), Mbumbu (*Discocalyx fusca*), and such undergrowth as Muskarimba (*Cyrtandra* spp.), Kula (*Aglaia elegans*), *Ophiorrhiza leptantha,* and the usual wet forest pteridophytes.

About noon we attained the main crest, and one of the boys took bearings by climbing a tree. The crest appears to be a long curved ridge, more or less level until abruptly, towards its southeastern extremity, it rises into the peak of Mbatini. An adjoining peak of about the same elevation, Soro Levu, is distant less than half a mile from Mbatini, connected to it by a sharp saddle; the two peaks are properly part of the same mountain. After a brief lunch we set out along the ridge, laboriously cutting a way through the dense tangle. The crest vegetation is very different in aspect and in its component species from that of the slopes. The trees as a rule do not attain such large dimensions, while lianas and epiphytes are more luxuriant. Woody plants of common occurrence on the

FIGURE 3. A Fijian in the forest obtains a drink of water from the Wa wai (*Entada phaseoloides*).

high ridges are Natha (*Antidesma insulare*), Langolango (*Ascarina lanceolata*), Ndokoriloto (*Melastoma denticulatum*), Mburuni (*Tapeinosperma* sp.), Ndongondongo (*Timonius affinis*), and Kirakira (*Scaevola* sp.). A frequent terrestrial fern is the beautiful *Didymochlaena truncatula,* while the more common ferns *Blechnum Patersoni* and *Histiopteris incisa* form dense tangles which must be patiently cut through. On every hand the dominant Merimeri (*Freycinetia* spp.) forms compact masses, impeding progress. Many epiphytic ferns and orchids thrive among the damp mosses and lichens, with species of *Peperomia*.

At three o'clock, perforce traveling very slowly in the luxurious vegetation, we had not made great progress towards the peak. I decided to return to the camp rather than be overtaken by dark on the cold ridge, so we retraced our steps, arriving at the foot of the buttress after dusk. The evening, as the preceding, was spent pleasantly around the welcome fire.

In the morning one of the boys told me that we might reach the main ridge more quickly by following the stream, although he thought the going would be difficult. So we toiled up the streambed, now wading through cold stony pools, now climbing steep cliff faces over which water plunged. Naturally, the plants were not exactly a duplication of the preceding day's, and I obtained among others specimens of a beautiful species of *Elaeocarpus,* with pendent clusters of rich pink flowers. The stream divided and redivided, finally dwindling to a trickle and then disappearing altogether as we again reached the crest considerably nearer the peak than we were the preceding afternoon. Encouraged by the success of the climb, the boys cut their way swiftly, and soon we were ascending the final precipitous slope. This is a narrow ascending ridge not more than ten feet broad on the crest, dropping sharply on either hand to vertical cliffs. However, the vegetation is so dense that the ascent is not precarious, except for a few bare rock faces which had to be circumvented. Before mid-afternoon we stood on the tiny summit, surveying the entire island from its highest point. We were fortunate in the weather, which permitted a view of coasts and mountains from Seatura in the west to the cloud-capped island of Taveuni in the east. The views from the higher peaks in Vanua Levu are among the most serenely beautiful

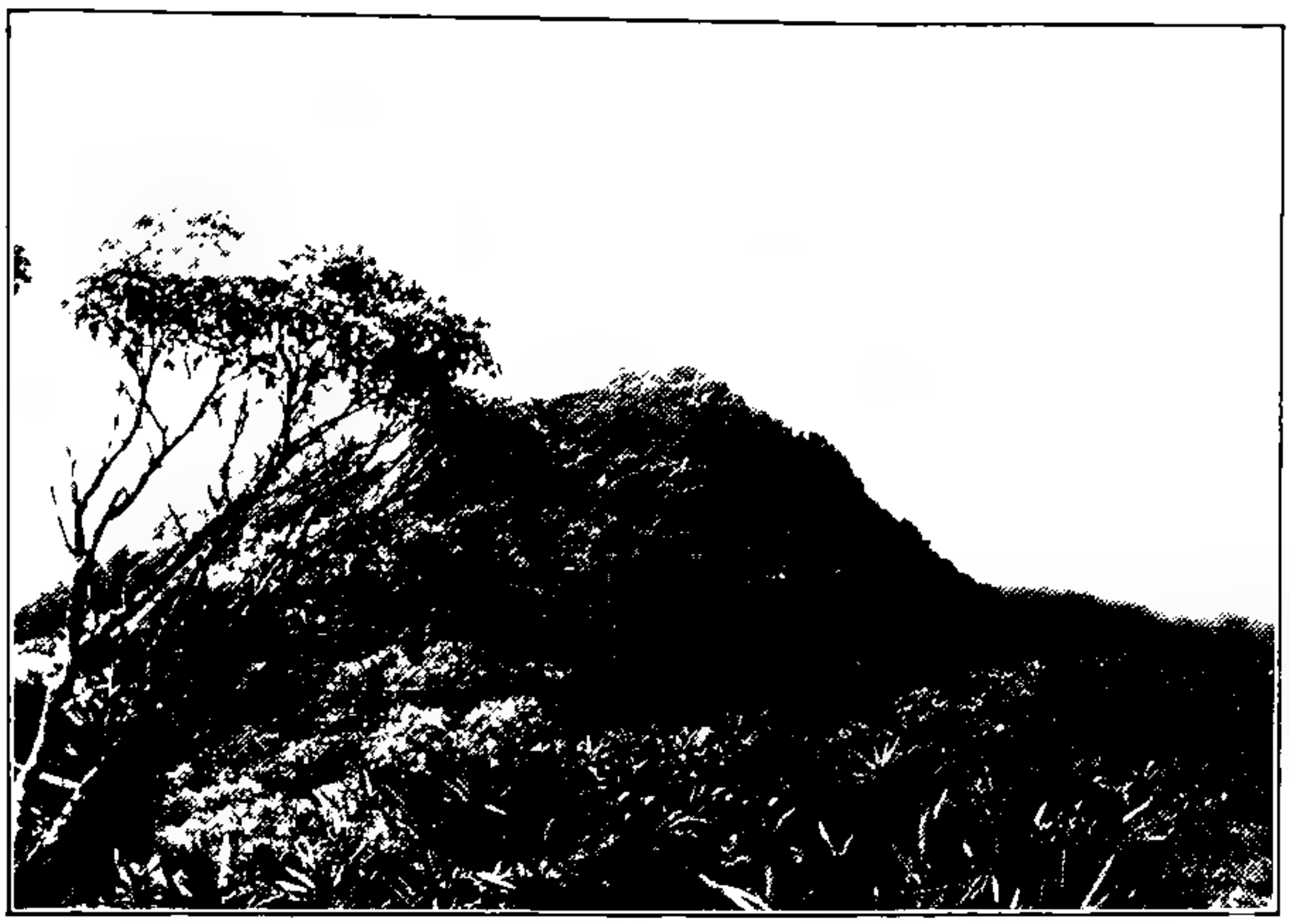


FIGURE 4. The summit of Uluingalau (alt. 1,220 m.), on the island of Taveuni, the second highest peak in Fiji. The leaves of a *Freycinetia* are seen in the foreground.

imaginable: the dark jagged ridges, the sinuous coast lines, and the sea.

The summit supports no large trees, but many of the usual ridge shrubs are present. On Mbatini one observes compact shrubs of the genera *Geissois, Metrosideros, Sideroxylon, Tristania, Decaspermum, Calycosia,* and others of a similar gnarled habit. A beautiful small-flowered orchid forms dense terrestrial clumps on the highest point of the mountain.

At length we worked down the sharp rocky stream-bed to the camp, the boys laden with specimens. The next morning we returned rapidly to Vatukawa, where immediately I commenced the processes of recording, pressing and drying. While I continued my routine work the next day, the boys built two mbilimbilis, or bamboo rafts, to carry my baggage down to the coast. The field botanist cannot travel lightly, needing an abundant supply of paper, driers, and corrugated boards, as well as small drying stoves, fuel oil, and camping equipment. The following morning we left Vatukawa and drifted leisurely down the river to meet, by previous ar-

rangement, the small launch which carried us to Savusavu, the district capital.

From an ecological viewpoint, the Korotini Range is probably the most interesting ridge in Vanua Levu. It is nearly level, with an average altitude of 700 to 900 meters, and forms the watershed for ten miles of the island's length. We ascended this range from the south, on an old track between Vatukawa and the north coast. At the summit, we left the track and followed a surveyor's line along the crest several miles to Ndelaikoro, the high point of the range. The southern slope is essentially like the slope of Mbatini, whereas the northern slope, from which much of the rain is cut off, bears vegetation of a very different type. On this slope there are extensive patches of open reed country, broken here and there by typical dry thickets. The crest of the Korotini Range, which varies in width from a few yards to two miles, presents a mixture of wet and dry zone floras, and one finds growing on the one hand the luxurious wet forest above described, on the other the dry forest with such plants as Ndoi (*Alphitonia excelsa*), Thevua (*Vavaea amicorum*), Mathouvu (*Cinnamomum pedatinervium*), Usi (*Dodonaea viscosa*), Yaro (*Premna taitensis*), and Nungganungga (*Decaspermum fruticosum*).

Another portion of Vanua Levu which merits a brief description is the central portion drained southward by the Wainunu and Yanawai Rivers. My work here was unfortunately hindered by untimely rains in May, but it is apparently a region of unusual geological and botanical interest. The backbone of the island here falls to an elevation of about 300 meters, interrupted by many chaotic sharp peaks. The luxurious forest which covers the region is unusually rich in conifers. Such species as Ndakua (*Agathis vitiensis*), Ndakua salusalu (*Podocarpus vitiensis*), and Yaka (*Dacrydium elatum*) are common, among such angiospermous trees as Thaukuro (*Casuarina nodiflora*), Ndamanu (*Calophyllum* spp.), Mako (*Drepananthus* sp.), Mbulu (*Palaquium* sp.), and Raumba (*Garcinia sessilis*). On the ridges of this region are found such smaller woody plants as Mbau (*Podocarpus neriifolius*), Ndrautolu (*Evodia cucullata*), and *Eugenia* spp., which, accompanied by the orchid *Dendrobium Mohlianum*, the fern *Dipteris conjugata*, and many other epiphytic orchids and cryptogams,

give even the low ridges an aspect similar to the tops of mountains farther to the east.

The success of my work on Vanua Levu depended very largely upon the hospitality and assistance of government officials, and I am indebted to Messrs. J. Goepel, P. D. Nightingale, and J. C. Munday. Concerning accessibility to the interior of the two large islands of Fiji, I would like to express appreciation of the surveying done by the Lands Department of the Colony. The large scale map which is now being completed will be of the greatest importance to future scientists. In Vanua Levu I was fortunate in following some of the surveyors and making use of their tracks in very difficult terrain; particularly I have benefitted from the work and advice of Messrs. Stokes and Bygrave. H. B. Guppy's work[6] on the geology of Vanua Levu is indispensable to any field scientist who works on that island.

For five weeks in December and January I stayed on Taveuni, a large volcanic island off the eastern coast of Vanua Levu. This is one of the most fertile islands in the archipelago, and a center of

[6] Guppy, H. B. Observations of a naturalist in the Pacific. Vanua Levu. 1 : i–xix, 1–392. illus. 1903.

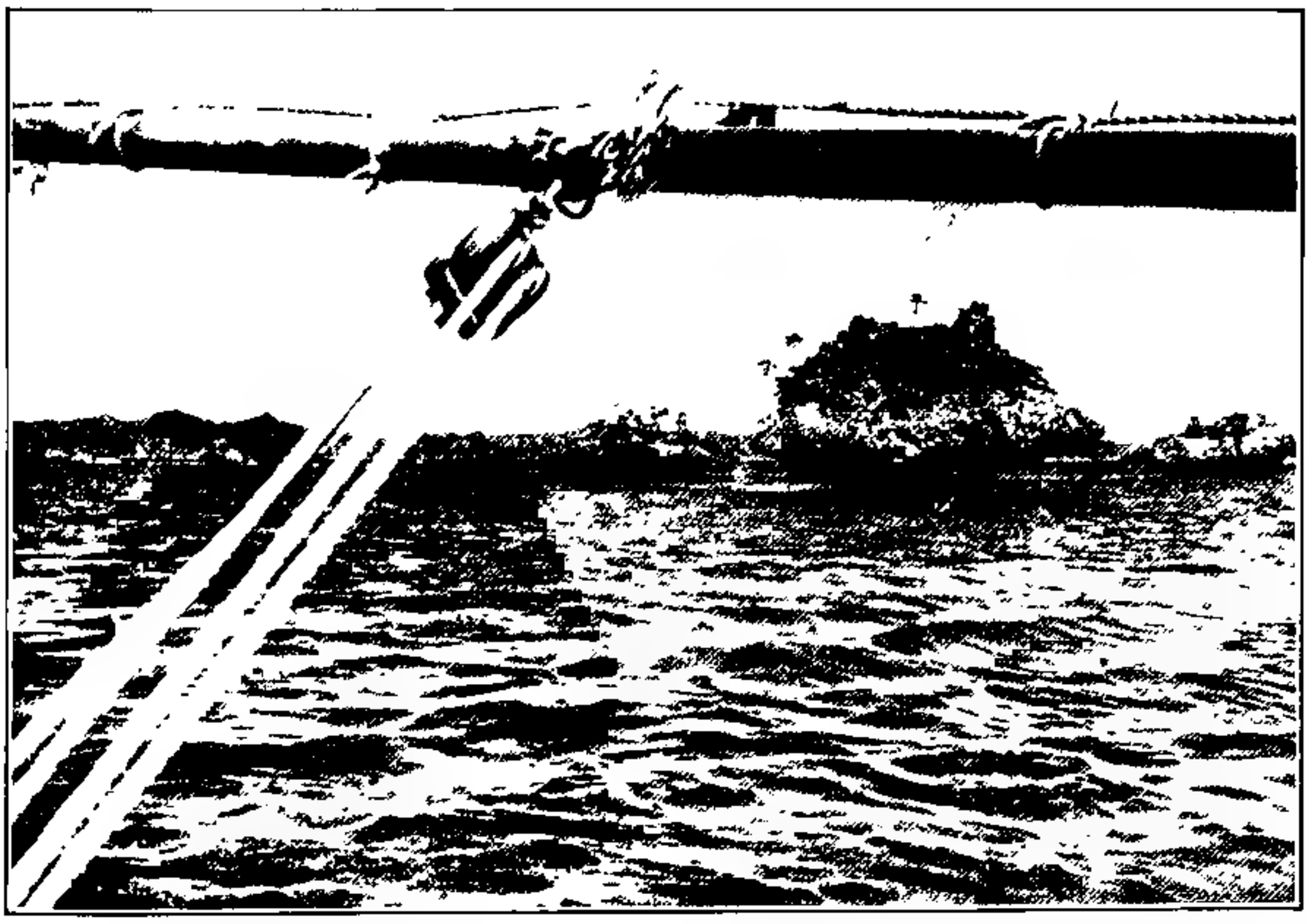


FIGURE 5. Undercut limestone islets in the lagoon of Fulanga. The conspicuous palms are *Pritchardia pacifica.*

the copra industry. Essentially all the land up to an altitude of 300 meters is planted to coconuts, a good part of it being owned by Europeans. My visit to Taveuni was made very pleasant by the many planters and especially by Dr. H. S. Evans, the District Commissioner. In topography, Taveuni consists of a high ridge running practically the length of the island, from northeast to southwest. The summit of the ridge, which is only a few miles from the sea on either side, varies in elevation from 800 to 1,220 meters, which latter elevation is attained by Uluingalau, the second highest peak in Fiji. The slopes of the ridge, above the coconut land, are covered by a dense forest similar to that on Vanua Levu, but poorer in number of species. One repeatedly observes such trees as Raidambo (*Dysoxylon Hornei*), *Litsea Pickeringii,* and *Hedycarya dorstenioides*. The last is probably the most common tree in the Taveuni forest, taking possession of the considerable stretches where wild cattle have killed seedlings of other species. Among attractive flowering shrubs of the Taveuni slopes may be mentioned Mothelutu (*Astronidium parviflorum*) and Sathasatha (*Codiaeum variegatum*). In many places *Geophila herbacea* covers the forest floor, together with many beautiful terrestrial orchids known collectively as Varavara.

During my stay I made several visits to the summit of the ridge, including two to Uluingalau. The vegetation at high elevations does not differ markedly from that on Vanua Levu, with the possible exception that this ridge, being extremely wet, supports a great profusion of epiphytic cryptogams. The summits are nearly always cloud-covered, but on one trip to Uluingalau, in company with Mr. Ronald Paine, an English entomologist, I was able to get a splendid early morning view of the entire island and the adjacent part of Vanua Levu. The ridge is seen from this elevation to be broken and irregular, marked by several small old craters. These crater holes, being poorly drained, support extremely interesting swamps, where epiphytic vegetation attains such luxuriance that the supporting plants are quite invisible.

Towards the northern end of the island the ridge divides, permitting the formation of an extensive morass at an altitude of about 700 meters. Seemann has described[7] in considerable detail a

[7] Seeman, A. B. Viti, an account of a government mission to the Vitian or Fijian Islands in the years 1860–61 : 28. 1862.

visit to this "lake," which is the largest and highest in Fiji. Apparently the morass occupies the crater of an extinct volcano, covering an area of perhaps two by four miles. It would appear that this area was originally all occupied by the lake, but gradually vegetation has been creeping in from the edges, forming a quaking crust over the deep water. The actual "lake" is now no more than a few hundred meters long, but there are many ramifications and chasms in the crust which make walking difficult and dangerous. The decayed vegetation which makes up the crust is probably not more than a meter thick, as holes can be probed through it in many places. The predominant plant of the morass is a sedge, Mototuila (*Lepironia mucronata*), with which are associated *Sphagnum Seemanni* and a mixture of gelatinous microscopic algae (species of *Aphanothece, Rhizoclonium, Tetmemorus, Stigonema,* etc.). The humus formed chiefly by these constituents supports several species of small shrubs, such as *Metrosideros polymorpha, Weinmannia affinis,* and *Rapanea* sp. The dense forest which surrounds the morass is known throughout Fiji as the home of the beautiful Tangimothia (*Medinilla Waterhousei*). This melastomaceous liana spreads its glossy leaves, bright red bracts and peduncles, and delicate white flowers over the trees and shrubs, forming startlingly brilliant masses of color in the somber forest.

After a respite in Suva, I visited the island of Koro from January 26 to February 13. Koro is the largest of that group of islands known as Loma-i-Viti (in the center of Fiji), which it makes up together with Ovalau, Ngau, Nairai, and a few smaller islands. They are volcanic in origin. Koro attains an elevation of more than 500 meters, consisting of a single steep ridge which forms an extensive plateau towards the north. It reminds one of Kandavu and like that island it produces excellent bananas. The short rich valleys of Koro support many semi-cultivated trees with edible fruits. Among these are Ndawa (*Pometia pinnata*), Ivi (*Inocarpus edulis*), Kavika (*Eugenia malaccensis*), Vutukana (*Barringtonia edulis*), and Wi (*Spondias dulcis*). The plateau which forms the summit of Koro is covered with dense forest, and in many places is swampy underfoot. Among the common ferns of this wet region are *Angiopteris evecta* and *Cyathea plagiostegia.* Attractive woody plants found here are species of *Tabernaemontana, Calycosia,* and *Psychotria.*

Again returning to Suva, I was fortunate in being invited to join the government cruiser "Pioneer" on a trip to the Windward Islands, known as the Lau group. Transportation in this group is as a rule infrequent, so I was delighted with the opportunity, the more so as the American geologists, Dr. E. J. Hoffmeister and Dr. H. S. Ladd, were also traveling to Lau for a few months of field work. Leaving Suva on February 17, we touched at Vanua Mbalavu, Mango, and Thithia before arriving at Fulanga. Here Dr. Ladd and I left the "Pioneer," which continued on its official

FIGURE 6. *Pandanus odoratissimus* in an open swamp, near the summit of the island of Moala.

visit to other islands of the group. The week which I spent on Fulanga is among the most pleasant of my memories of Fiji. The Lauans are a mixture of Melanesian and Polynesian, differing from western Fijians in appearance and customs. They are an extremely hospitable people, courteous and good-humored, naturally very interested and amused by the movements of the vunivatu (doctor of rocks) and the vunikau (doctor of wood).

The first two weeks of March I spent on the nearby island of Kambara. Most of the islands of southern Lau, of which these two are typical, are formed of upraised limestone, elevated above

the sea to 100 meters or less. Fulanga is a ring-shaped island, two or three passages giving access to its beautiful lagoon, which is studded with hundreds of small islets. Eaten away at the base by action of the water, the islets resemble grotesque mushrooms. The soil covering of these limestone islands is very thin, often lacking, but the vegetation is surprisingly dense. Kambara, especially, supports forests of large trees. The Vesi (*Intsia bijuga*) attains large dimensions here, being used to make Yanggona bowls which are famous throughout Fiji. Yanggona (the Kava of Polynesia) is made from the roots of the widely cultivated *Piper methysticum*. Many of the outrigger canoes used not only in Lau, but also in Tonga, were made on Kambara, the Manui (*Pleiogynium Solanderi*) being valued for this purpose. Other trees of the limestone which grow to large size are Vuvula (*Harpullia arborea*), Kaukauloa (*Diospyros* sp.), Vathea (*Elaeocarpus* sp.), Tokai (*Dysoxylon* sp.), and Nggoringgoriwai (*Eugenia* sp.). Common smaller woody plants are Tambutasia (*Guettarda inconspicua*) and Langakali (*Aglaia edulis*), the flowers of the latter being a popular component of the Salusalu, or floral necklace, worn on festive occasions. The Lauans make wide use of three plants to scent coconut oil; these are *Pandanus odoratissimus,* of which the inflorescence bracts are used, Makusui (*Canangium odoratum*), and Mbua (*Gardenia taitensis*), of which the fragrant flowers are used. The beach vegetation of the Lau Islands does not differ markedly from that of the volcanic islands, but perhaps one finds here in greater abundance such woody plants as Evu (*Tournefortia argentea*), Vetao (*Ochrocarpus excelsus*), Uto (*Terminalia litoralis*), and Evuevu (*Hernandia ovigera*). The small limestone islets of the Fulanga lagoon are covered with trees of a graceful palm, Masai, or Viu (*Pritchardia pacifica*).

The Lau Islands may be divided into three groups, in each of which I visited at least one island. The two islands already described are typical of southern Lau, while Vanua Mbalavu is representative of northern Lau. Three islands, Moala, Totoya, and Matuku, lying between Lau proper and Viti Levu, make up the third group. Following my visit to Kambara, I spent a week on Moala in the latter part of March. This is the highest island in Lau, attaining an elevation of more than 400 meters. It is primarily volcanic in origin, its vegetation bearing a decided resem-

FIGURE 7. The Bay of Islands, in the limestone region of Vanua Mbalavu. The islands of Kanathea and Naitamba are seen on the horizon.

blance to that of Loma-i-Viti. However, the plateau which forms the summit of Moala is an unusual type of open land, being in part marshy, with small deep lakes which are surrounded by stands of Mbalawa (*Pandanus odoratissimus*). The chief herbaceous plants of the open land are a sedge, Thondamu (*Fimbristylis annua*), an inconspicuous orchid, and the ferns *Pteridium aquilinum,* Vuloa (*Schizoloma ensifolium*), Mboreti (*Blechnum orientale*), and *Dennstaedtia* sp. The dwarf shrubs *Wikstroemia foetida* and *Commersonia bartramia* are common, and a small tree, Molaundamu (*Weinmannia vitiensis*), grows profusely among trees of the common Nokonoko (*Casuarina equisetifolia*). The open land is surrounded by dense growth of such low woody plants as Vutukalou (*Amaroria soulameoides*), Mbua (*Fagraea Berteriana*), and *Astronidium* sp.

Vanua Mbalavu, in northern Lau, was visited at the beginning of April. This long narrow island has a central portion which is volcanic in origin, while both ends are of upraised limestone. Because of the variety of soils which it offers, and because it is the largest island in northern Lau, Vanua Mbalavu merits a longer botanical visit than mine. The volcanic portion of the island is poorer in number of species than Moala, but the limestone sections are quite rich. Here, in addition to the usual limestone-dwelling plants, I found a small saprophyte, *Sciaphila* sp., the whole plant being only two or three inches high and rich purple. Such trees as Nggalaka (*Lucuma vitiensis*), Vaivai (*Serianthes myriadenia*), Thevua (*Vavaea amicorum*), and Mbau (*Mimusops* sp.) are frequently seen.

The northern limestone section of Vanua Mbalavu is frequently mentioned as one of the beauty spots of Fiji, and everyone who has been fortunate enough to survey the "Bay of Islands" from a bordering cliff will confirm its reputation. From the water rise precipitous cliffs, undercut at their bases; miniature undercut islands dot the bays and inlets. The characteristic feature of the limestone formation in Lau is its dense vegetation, trees and shrubs gaining a foothold even where soil is completely lacking. Seen from a high vantage point, such an island is a bright green land, surrounded by sparkling sea which the underlying reefs tint from blue to green.

With considerable regret I left this most beautiful part of Fiji in April and returned to Suva. My work in Lau was greatly facilitated by the hospitality of Ratu J. L. V. Sukuna, the District Commissioner, and his charming wife, Andi Maria. Transportation in this part of Fiji is at best haphazard, and only the coöperation of Ratu Sukuna made it possible for me to visit the desired representative islands.

My last months in Fiji, as mentioned, were spent on Vanua Levu. On July 3 I left Suva for the last time and returned to Honolulu, where a month was spent making a preliminary sorting of the plants. A total of 2008 herbarium numbers was collected, in sets of ten or eleven, and also 817 wood specimens. The first set of herbarium specimens will remain at the Bernice P. Bishop Museum, the second at The New York Botanical Garden, and the remaining material will be distributed to other institutions. Wood specimens were collected for the Yale School of Forestry. Identifications will be made at The New York Botanical Garden and by various specialists.

For the opportunity of working with such a fascinating flora as that of Fiji I am deeply indebted to the Bernice P. Bishop Museum and to Yale University. I have not space to thank individually my many friends in Fiji, both European and native, whose kindness was so essential in making my visit profitable and pleasant. It is a country which one cannot visit without desiring to revisit, a country in which a scientist may be assured of hospitality and coöperation on every hand.

A. C. Smith.

STUDENT-GARDENER TRAINING

In the fall of 1932 the Garden entered into a new sphere of activity—that of the systematic training of professional gardeners. For a number of years thoughtful horticulturists had appreciated the desirability of having, in this country, facilities corresponding to those available in Europe for training young men as gardeners and horticulturists.

Since this work is deemed important enough to receive attention at such well-known botanic gardens as those at Kew, Edinburgh, and Berlin, it seemed appropriate that The New York Botanical Garden, as the largest institution of its kind in America, should be the organization to undertake this type of work in this country. The scheme which went into effect involved the assignment of a number of the younger men employed at the Garden as student-gardeners, plus additions to this student body as vacancies become available.

The training of the student-gardeners covers a period of two to three years, at the completion of which they are expected to seek employment elsewhere. During this training period the student-gardeners receive compensation sufficient to meet ordinary living expenses. The work at the Garden is so organized that they are given an opportunity to become widely acquainted with plants and to gain a sound knowledge of the basic principles of their culture under essentially practical conditions. This most important practical work is supplemented by a course of lectures dealing with the sciences upon which gardening is based and by actual demonstrations among the living and museum collections, given by members of the Garden staff.

During the present year four new student-gardeners have been appointed and a number of approved applications are still on file. To qualify as student-gardeners men must be American citizens, 21 years of age, unmarried, and must have completed high school and have had at least two years' experience in good gardens or nurseries. In response to a demand for opportunity to gain training from men who could not meet the last mentioned requirement, two apprentice-gardener scholarships, each of a value of $500 and tenable for one year, were offered and filled this fall. The ap-

prentice-gardeners receive essentially the same training as do the student-gardeners.

It has been the practice at Kew for several years to exchange student-gardeners with other European botanical institutions, the exchange students remaining away a year.

While in England last summer, I discussed with the Kew authorities the possibility of our entering into a similar arrangement, a plan in which they indicated they would be willing to coöperate. Such an international exchange serves to broaden the experience, not only of the students who travel, but also, by contact with foreign students, of those who complete their training in their home institutions.

One difficulty at present, however, is the expense of transportation, a cost which few young gardeners could be expected to be able to meet. It is hoped that private funds may be available for this purpose as well as for possible additional scholarships to support student- and apprentice-gardeners.

The courses of lectures, which cover Systematic Botany, Plant Morphology, Plant Physiology, Plant Breeding, Plant Pathology, Soils and Fertilizers, and Entomology are given throughout the winter months every Monday evening in the rooms of the Horticultural Society of New York at 598 Madison Avenue, New York City, and are available to professional gardeners and nurserymen who are not employed at the Garden on payment of a nominal fee. The lecture course entered upon its third year on October 1st with a record enrollment, in the first-year class, of sixty-six. This number includes (in addition to our student-gardenerers and gardeners not employed here) a number of our own men who are taking the lectures voluntarily. Upon the satisfactory completion of the lecture courses a certificate is awarded.

That a demand exists for a course of training for professional gardeners along just such lines as we have followed is evidenced by the number of inquiries we have received and by the response of the men appointed as student- and apprentice-gardeners. Indeed, a number have taken part in the work without financial compensation and solely in return for the experience and training they gain.

While it is quite true that in the past America has depended almost entirely upon European gardeners, now, owing to the quota

system applied to immigration, this source of supply is no longer adequate; yet it is obvious that if American horticulture is to continue to progress, a supply of well-trained gardeners acquainted with plants and above all thoroughly versed in all phases of their cultivation must be available. Experience elsewhere has abundantly proved the value of a few years spent in a botanic garden as part of the training of a gardener. Under such conditions he has the opportunity to become acquainted with a much greater variety of plants than is usually possible elsewhere, he begins to appreciate the significance of plant relationships and the importance of correct nomenclature, and he learns to approach his particular problems from a scientific viewpoint and to make use of the findings of scientific work.

Furthermore, he becomes acquainted with valuable sources of information and with scientific men to whom he can frequently turn for assistance.

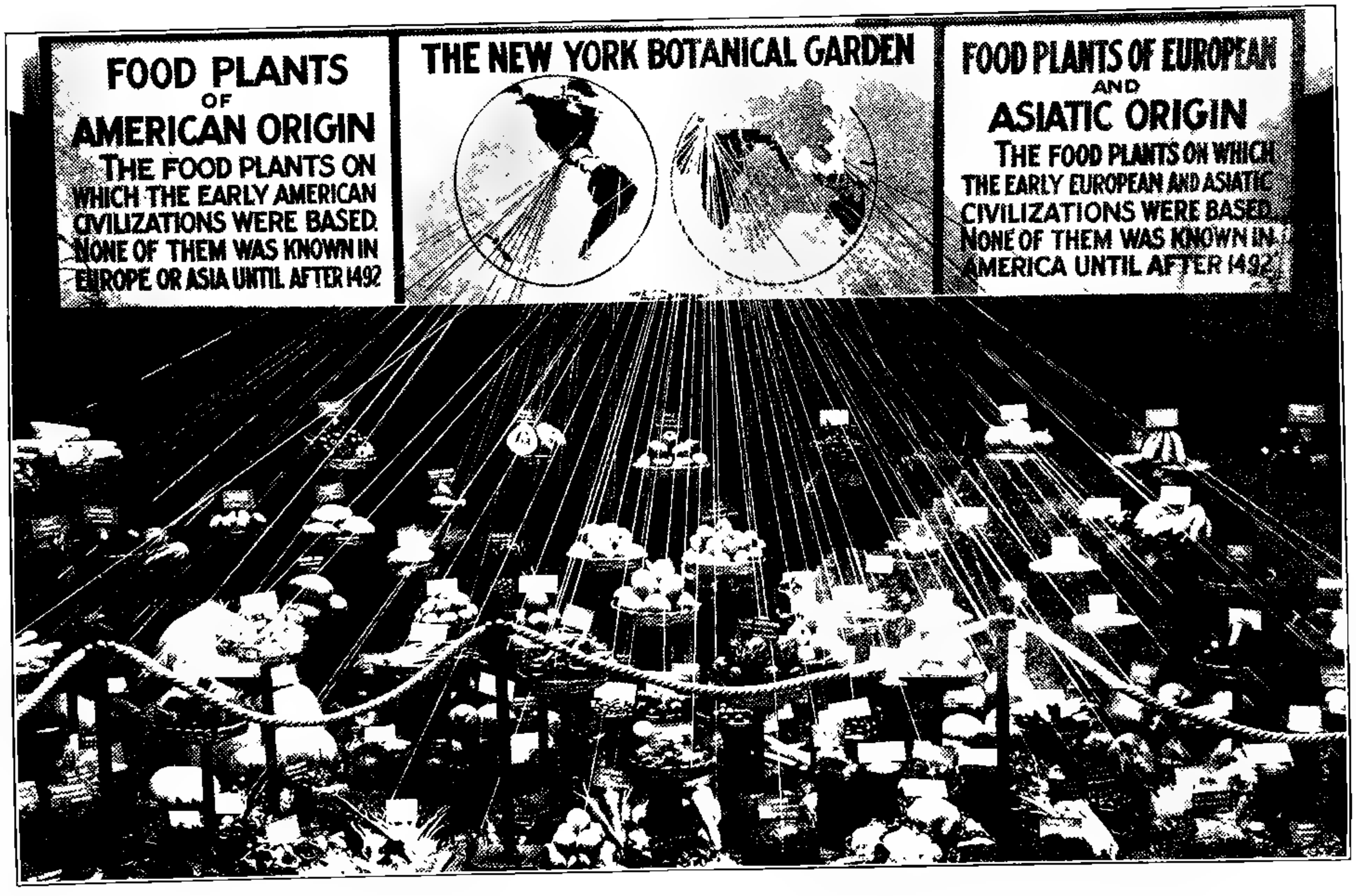
It is true that the danger exists of placing too much emphasis upon science, but by proper insistence upon the importance of practical gardening operations performed in a workmanlike manner this tendency can be avoided. The careful selection of men is also an important factor in this regard.

T. H. EVERETT.

GOLD MEDAL FOR FOOD-PLANTS EXHIBITED AT FALL FLOWER-SHOW

Nearly impenetrable crowds surrounded The New York Botanical Garden's picturesque educational exhibit at the fall flower-show of the Horticultural Society of New York, November 8–11, at the American Museum of Natural History. A gold medal was awarded for the display, which demonstrated the geographic origins of the principal cultivated food-plants of the world.

About 150 kinds of fruits, cereals, and vegetables were assembled for the exhibit, each one of which was labeled with its common and scientific name and its place of origin, then was attached to a colored ribbon which led from the specimen to the approximate position on a map of the world whence the species originally came.


FOOD PLANTS
OF
AMERICAN ORIGIN
THE FOOD PLANTS ON WHICH THE EARLY AMERICAN CIVILIZATIONS WERE BASED. NONE OF THEM WAS KNOWN IN EUROPE OR ASIA UNTIL AFTER 1492
THE NEW YORK BOTANICAL GARDEN
FOOD PLANTS OF EUROPEAN
AND
ASIATIC ORIGIN
THE FOOD PLANTS ON WHICH THE EARLY EUROPEAN AND ASIATIC CIVILIZATIONS WERE BASED. NONE OF THEM WAS KNOWN IN AMERICA UNTIL AFTER 1492

In a statement distributed to visitors during the show, Dr. E. D. Merrill, Director, explained the exhibit in the following words:

"All cultivated plants were derived from wild species. Every important cultivated food-plant now utilized was actually in cultivation at the dawn of recorded history.

"This exhibit demonstrates that all of the cultivated cereals except maize or Indian corn, and most of the temperate zone vegetables and fruits are of European or Asiatic origin. These include wheat, barley, rye, oats, rice, millet, sorghum, Italian millet, buckwheat, turnip, carrot, parsnip, beet, cabbage, chard, mustard, radish, onion, leek, garlic, spinach, egg-plant, lettuce, endive, celery, asparagus, globe artichoke, pea, lentil, broad bean, apple, pear, plum, cherry, wine grape, apricot, peach, prune, olive, fig, almond, melon, watermelon, cucumber, orange, lemon, lime, date, mango and many others. Not one of these was known in America until after it was introduced by the European colonists.

"The important American contributions include maize or Indian corn, the potato, sweet potato, all types of squashes and pumpkins, all varieties of garden and field beans, lima bean, tomato, pepper, Jerusalem artichoke, cacao, cashew, papaya, avocado, cassava or tapioca and the peanut. These are the plants basic to the agriculture of North and South America, on which the early high civilizations of Mexico, Central America, Bolivia and Peru were based. Not one of them was known in Europe or Asia until after the voyage of Columbus in 1492.

"In the history of civilization it may be noted that man failed to transmit his basic cultivated plants across either the Pacific or the Atlantic until the era of modern exploration beginning at the close of the 15th century; that is, the distribution of cultivated plants up to that time was limited to one or the other of the two hemispheres. The European and Asiatic civilizations were based on one series of cultivated plants and the early American civilizations on a totally different series, quite unrelated to those of the Old World. In other words, agriculture originated independently in various centers in both hemispheres, and in each case in or near those areas where our now cultivated food-plants occurred as wild species. The important centers in America are Mexico, Central America, Bolivia, and Peru; in Eurasia the Mediterranean basin, southern Europe, Asia Minor, central Asia, northern India and

central and southern China. There is a very close correlation, it can be readily seen, between the places of origin of our cultivated food-plants and the centers of ancient civilizations."

BEQUEST FROM THE WILL OF K. K. MACKENZIE

The New York Botanical Garden receives a bequest of ten thousand dollars from the estate of Kenneth K. Mackenzie, member of the Board of Managers, who died October 22. An additional gift of all of his plant specimens and drawings is also made. Mr. Mackenzie had previously presented to the Garden his collection of 43,000 herbarium sheets. The gift of money is to be used for the completion of publication of his work, according to the stipulations of his will, two sections of which read:

"Second: I give and bequeath absolutely to the New York Botanical Garden any and all botanical specimens owned by me and also all the drawings of plants made for me by H. C. Creutzburg."

"Seventh: I hereby direct that my executors, hereinafter named, shall sell all my household furniture and real estate at either public or private sale in their absolute discretion, such sale or sales to take place at such time or times, in such manner and on such terms as my executors in their absolute discretion shall deem advisable, and to receive the proceeds thereof and to pay to the New York Botanical Garden the sum of Ten Thousand Dollars from such proceeds to be used, together with any income on said Ten Thousand Dollars, in the completion and publication of the drawings bequeathed to said Garden under the second paragraph of this my will."

The 691 illustrations thus bequeathed to the Garden are beautifully executed drawings of North American Cyperaceae.

LECTURES SCHEDULED FOR THE WINTER MONTHS

Plant life of many foreign lands as well as of sections of America will be described in the series of free, illustrated lectures to be given each Saturday at 3:30 p. m. at The New York Botanical Garden during December, January, and February. Some of the

subjects, besides, are concerned with the growing and care of plants. The lectures scheduled are as follows:

Dec. 1. "Present Day Hawaii," Mr. Ray Jerome Baker, of Honolulu. Illustrated by motion pictures.
Dec. 8. "Growing Plants in Glass Houses," Dr. Forman T. McLean, Supervisor of Public Education.
Dec. 15. "Trinidad," Dr. Fred J. Seaver, Curator. (Supplemented with motion pictures by Dr. Edmund Fulling).
Dec. 22. "Caring for Christmas Plants," Mr. T. H. Everett, Horticulturist.
Jan. 5. "Origins of Cultivated Plants," Dr. Harold N. Moldenke, Assistant Curator.
Jan. 12. "Plant Life on Robinson Crusoe's Island," Dr. Carl Skottsberg, Yale University.
Jan. 19. "Botanizing in Fiji," Dr. Albert C. Smith, Associate Curator.
Jan. 26. "Plants Utilized by the American Indians," Mr. G. L. Wittrock, Docent.
Feb. 2. "Travels in Central America, Studying the Sources of Chewing Gum," Dr. John S. Karling, Columbia University.
Feb. 9. "Puerto Rico: Its Flora and Scenery," Dr. Marshall A. Howe, Assistant Director.
Feb. 16. "The Improvement of Cultivated Plants," Dr. A. B. Stout, Director of the Laboratories.
Feb. 23. "A Trip Through Wisconsin," Dr. B. O. Dodge, Plant Pathologist.

NOTES, NEWS, AND COMMENT

At a monthly conference of the scientific staff and registered students of the Garden, held November 15, Dr. J. H. Barnhart spoke on the early collection of plants which was recently found and presented to The New York Botanical Garden, as described in the November JOURNAL, and Dr. A. C. Smith gave a historical sketch of botanical work in Fiji.

Dr. B. O. Dodge is addressing the seminar of the Rockefeller Institute for Medical Research at Princeton University December 10 on hybridization of the bakery mold, *Neurospora*.

"Mental Excursions" is the title of the presidential address which Dr. E. D. Merrill will present before the Botanical Society

of America during the annual meeting of the American Association for the Advancement of Science in Pittsburgh, December 27–29.

Dr. H. A. Gleason is to take part in a symposium on the teaching of systematic botany, speaking on "The Neglect of Some Important Families."

At the meeting of the Genetic Society of America, Dr. B. O. Dodge will give an address on "A Recessive Factor Lethal for Spore Formation in *Neurospora.*"

Coöperating with The New York Botanical Garden in building up its reference collections, Mr. Paul J. Robbins sailed recently for British Guiana to collect seeds and roots of aquatic plants.

The collection of gourds which attracted considerable attention and won a silver medal at the fall flower-show of the Horticultural Society of New York in November has been put on temporary display in the Museum Building at The New York Botanical Garden, through the courtesy of Miss Helen M. Tillinghast, who raised them at her gardens, known as "The Gourd-Vine," at Vernon, Conn.

In expectation of an unusual display of early spring flowers in the Thompson Memorial Rock Garden, more than 7,200 bulbs have been planted there this fall. These include thirteen species and varieties of *Muscari,* eight of *Galanthus,* fifteen of *Scilla,* four of *Eranthis,* nine of *Tulipa,* five of *Chionodoxa,* three of *Hyacinthus,* nine of *Fritillaria,* and twenty-one of *Crocus,* some of which will give broad drifts of color, while others, in smaller numbers, will occupy half-secluded spots and pockets between rocks, where individual types will show to best advantage.

Illustrations are being rapidly completed by artists assigned to the Botanical Garden for Dr. John K. Small's forthcoming volume, "Ferns in the vicinity of New York City." First proofs of the book, which covers the region within one hundred miles of the metropolis and which is designed for the use of amateurs, are expected shortly from the publisher.

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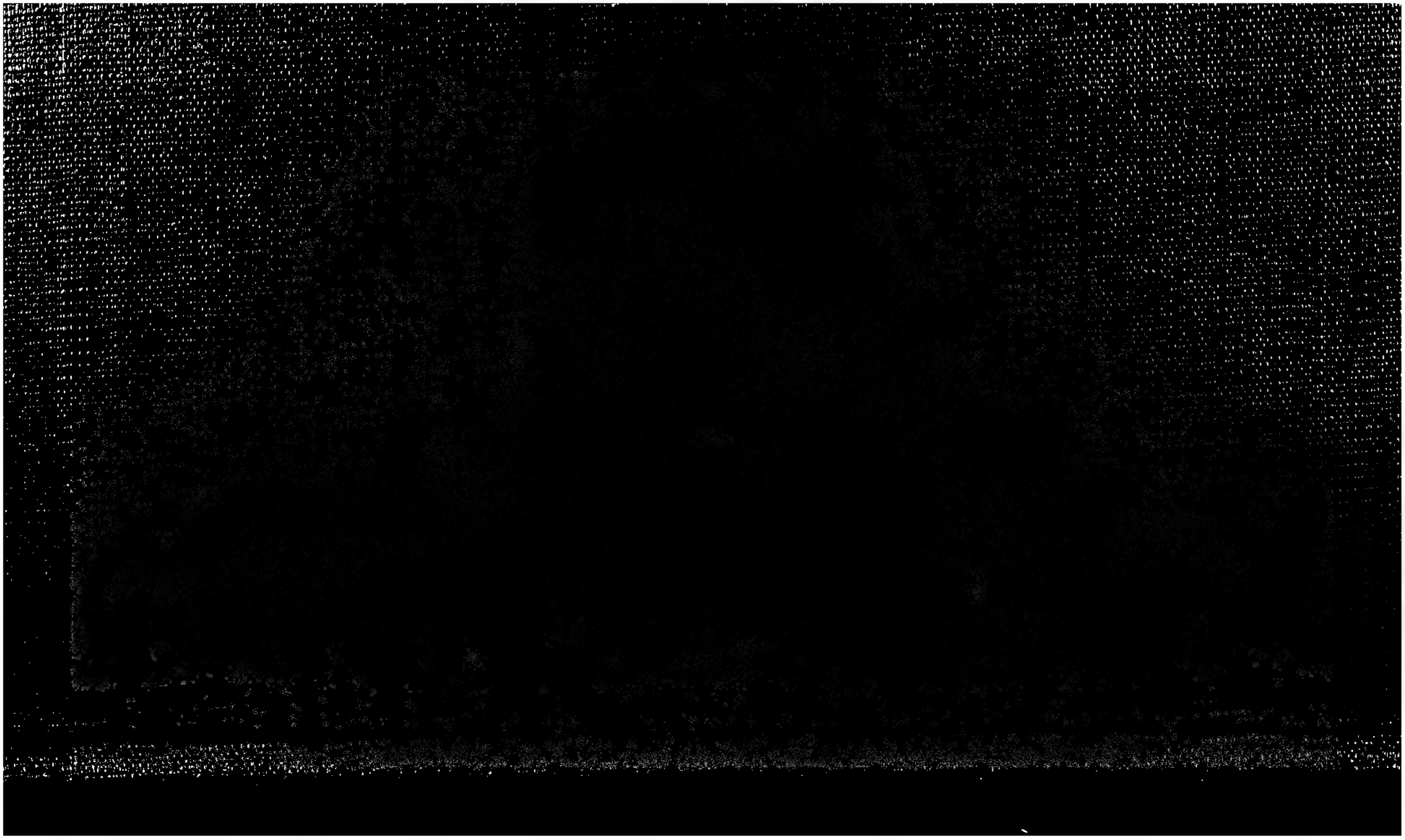

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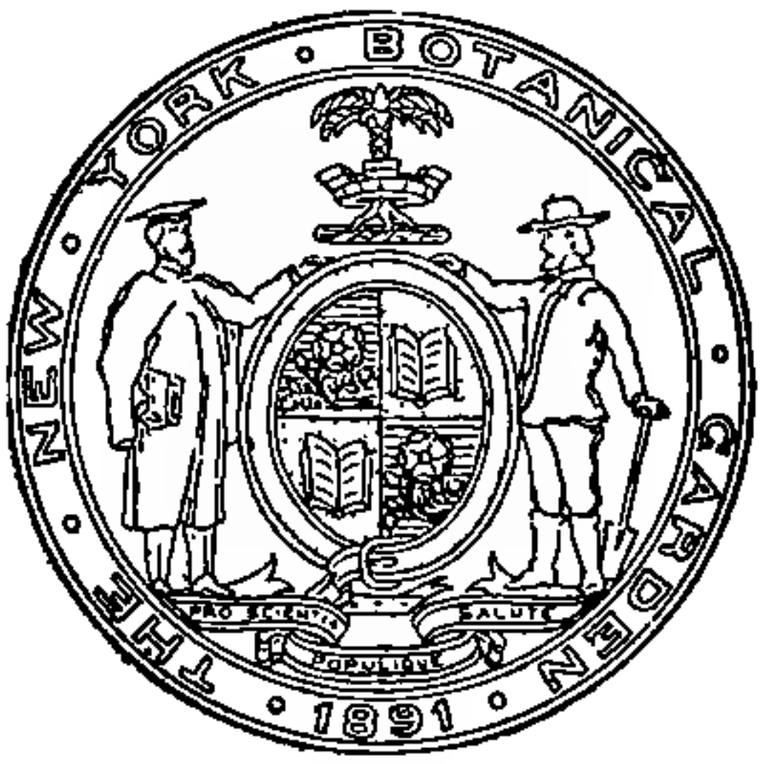

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VOL. XXXVI JANUARY, 1935 No. 421

JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

CHRONICLE OF THE CACTI OF EASTERN NORTH AMERICA
JOHN K. SMALL

IBOZA RIPARIA
T. H. EVERETT

EVENING COURSE IN GARDENING PRACTICE OFFERED THIS WINTER

PORTO RICO HONORS MEMORY OF DOCTOR BRITTON

BIRD AND WILD FLOWER SANCTUARY TO BE CREATED AT THE GARDEN

WINTER READING FOR GARDENERS
CAROL H. WOODWARD

A NEW FLORA OF WESTERN NEW YORK
H. A. GLEASON

VAN LEEUWENHOEK MICROSCOPE, IN REPLICA, PRESENTED TO GARDEN
CAROL H. WOODWARD

NOTES, NEWS, AND COMMENT

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CHRONICLE OF THE CACTI OF EASTERN NORTH AMERICA

The Atlantic Coastal Plain is a unique geologic feature of the Western Hemisphere. This area is situated between the older Piedmont Plateau and the Atlantic Ocean. It is the most recent complex geologic formation, so to speak, of any considerable extent in the eastern United States, and is composed chiefly of a great mass of eroded materials from the Piedmont Plateau and adjacent mountains; consequently, from its relation to the older continental plant reservoirs on the one hand and its relation to the West Indies on the other, we might safely assume that its flora and plant-geography would hold much of interest. In fact, successive incursions into the region justify this assumption, and studies in its vegetation as far as they have gone prove it.

The superficial part of the plain is made up chiefly of a conglomeration of the more recently broken down materials from the higher lands, more or less enriched by the decayed vegetable matter it supports. In addition to this geologic formation and geographic position, there is, moreover, such an amazing variety of climate and other physical conditions that botanical interest in the region is further enhanced. Yet its plants and their distribution, and the plant-associations inhabiting this most recent addition to eastern North America, have been intelligently studied to only a slight extent.

Eastern North America can scarcely be termed a cactus country, yet there are at least forty-four species of the cactus family growing naturally east of the Mississippi River. This total includes both native (majority) and naturalized (minority) species. The exotics represent slightly over 20 percent of the total.

The usual idea connecting cacti with deserts will not coincide with the facts in the case of most of these cacti to be considered. The great majority of the naturalized species are forest plants in their native haunts and have similar habitats in their adopted country. Among these are two species of the genus *Selenicereus,* one of *Hylocereus,* four of *Opuntia,* one of *Brasilopuntia,* and one of *Pereskia.* Among the native species there are one species of *Acanthocereus,* three of *Harrisia,* two of *Cephalocereus,* more than twenty-five of *Opuntia,* one of *Consolea,* and one of *Rhipsalis.* All these native species are hammock plants or, in the case of a few species in the dunes, plants usually growing in the vicinity of hammocks, with the exception of three species of *Opuntia* which prefer the conditions furnished by pinelands. These species are *Opuntia austrina,*[1] *O. lata,*[2] and *O. Opuntia.*[3]

With the exception of one species—*Opuntia Opuntia*—which also occurs often in woodlands, these cacti are confined to the Coastal Plain. Furthermore, speaking in political terms, most of the species are confined to one state, in this case Florida, while a few have ranges extending into the boundaries of one, two, three, or four states. Among the Coastal Plain species, *Opuntia Pollardi*[4] alone ranges from Alabama in the Gulf Coastal Plain to Delaware, and perhaps to southern New Jersey in the Atlantic Coastal Plain.

ANCIENT HISTORY

The chronicle of the cacti of the eastern Coastal Plain begins shortly after the discovery of America. Within four decades after the landing of Columbus, references to cacti in Florida were put on record. The following quotations from a single book written by Alvar Nuñez Cabeza de Vaca[5] indicate how important cacti were to the aborigines and to the early expeditioners.

[1] *Opuntia austrina* Small, Fl. SE. U. S. 816. 1903.

[2] *Opuntia lata* Small, Jour. N. Y. Bot. Gard. **20:** 26. 1919.

[3] *Opuntia* (*Cactus* L. 1753) *Opuntia* Karst. Deutsch. Fl. 888. 1882.

[4] *Opuntia Pollardi* Britton & Rose, Smiths. Miss. Coll. **50:** 523. 1908.

[5] The Journey of Alvar Nuñez Cabeza de Vaca (translation by Ad. F. Bandelier, 1905.)—J. K. S.

Alvar Nuñez Cabeza de Vaca was born at Jerez de la Frontera, near Cadiz, Spain, in or about the year 1490. He was treasurer of the expedition under Narvaez for the conquest of Florida. This expedition left Spain in June, 1527, and arrived on the west coast of Florida in April of

"After which time they would remove to another section in order to eat prickly-pears. These are a fruit of the size of eggs, red and black, and taste very good. For three months they subsist upon them exclusively, eating nothing else."—Page 81.

"Their best times are when 'tunas' [prickly-pears] are ripe, because they have plenty to eat, and spend the time in dancing and eating day and night. As long as these tunas last they squeeze and open them and set them to dry. When dried they are put in baskets like figs and kept to be eaten on the way. The peelings they grind and pulverize."—Page 91.

"In order to cheer us, they would tell us not to despair, since we would have tunas very soon and eat much and drink their juice and get big stomachs and be merry, contented and without hunger."—Page 92.

"During all the time we ate tunas [prickly-pears] we felt thirsty. To allay our thirst we drank the juice of the fruit, pouring it first into a pit which we dug in the soil, and when that was full we drank to satisfaction. The Indians do it that way, out of lack of vessels. The juice is sweet and has the color of

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the following year. On the first of May they set out on their journey inland, leaving instructions for their vessels to meet them at a supposed harbor that neither they nor the vessels ever found. The small fleet, after continuing its search for the land party for about a year, proceeded to Mexico. After many privations those on land reached a shallow bay on the coast somewhere west of Apalachicola, built five barges with the aid of stirrups, spears, palmettos, horsehair, shirts, and other miscellaneous supplies, and toward the end of September launched out into the Gulf of Mexico, without a man on any of the barges who understood navigation. They followed the coast to the mouth of the Mississippi, where the swift current dispersed them, the barge of Narvaez drifting out into the Gulf, and the others being wrecked at various points along the coast to the westward. The few survivors were killed by the Indians or by each other, or died of disease or exposure, until only four were left. These joined their fortunes, escaped from the Indians who had enslaved them, and amid almost incredible hardships made their way across Texas and northern Mexico to the Spanish settlements, which they reached in May, 1536, eight years after their landing in Florida, and seven and a half years after the wreck of the barges. The narrative of the journey, written by Cabeza de Vaca, who was one of the four, is among the most amazing in the annals of adventure. Cabeza de Vaca returned to Spain: a few years later he was in South America, where he explored and governed Paraguay from 1541 to 1544. In his later years he was a judge at Seville, where he died about 1564.—JOHN HENDLEY BARNHART.

must. There are many kinds of tunas, and some very good ones, although to me they all tasted well alike, hunger never leaving me time to select, or to stop to think which ones were better." —Pages 96 & 97.

"They went back to their abodes and brought us many tunas and a piece of venison."—Page 100.

"And that night they gave me of their tunas."—Page 104.

"Our Indians to whom I had given the tunas remained there." —Page 107.

"We lost the trail and found oureslves in a big forest, where we gathered plenty of leaves of tunas which we roasted that same night in an oven made by ourselves, and so much heat did we give them that in the morning they were fit to be eaten."—Page 118.

" . . . . and gave us of what they had to eat, which were leaves of tunas and green tunas baked."—Page 116.

" . . . . and told us that higher up the river we would meet with dwellings, plenty of tunas, and of that same meat."—Page 130.

"But seeing us alone, they lost their fear, and gave us tunas, though nothing else."—Page 137.

The following quotation is of interest because although not referring directly to cacti, the great importance of the food value of prickly-pears certainly must have had an important part in fixing the seasons, for it is recorded that:

"All these people had no reckoning by either sun or moon, nor do they count by months or years; they judge of the seasons by the ripening of fruits . . . ."—Page 111.

Cabaza de Vaca was the first white man to cross the American continent. He was in touch with cacti nearly all the way and nearly all the time during the seven or eight years of his journey. He, perhaps, had more experience with cacti as food-plants than any other white man.

MEDIAL HISTORY

The technical botanical history of the cacti begins with the year 1753 when Linnaeus[6] published twenty-two species.[7] All

[6] Carl Linnaeus, the "father of botany," was born 13/14 May 1707, at Rashult, Småland, Sweden. After a year at the University of Lund, he entered that of Upsala at the age of twenty-one. In 1732 he made his famous tour in Lapland, and during the next few years visited Denmark,

of them are correctly recorded as coming from or being native in the New World—North America, including the West Indies, and South America being represented. Among these species only one was referred to as coming from the region under consideration. This reference is to plants of a prickly-pear collected in Virginia by John Clayton.[8]

The pioneer plant collectors, with the exception of John Clayton, like most of the later ones, shunned cacti, as is evidenced by the fact that the cacti growing in regions whence a number of celebrated collectors supplied miscellaneous plants to gardens and botanists of the Old World, did not figure in the collections or in the literature of that time. It is not until the second decade of the present century—over a century and a half after plant explorers first entered the richest cactus fields in eastern North America —that this region was tapped for these usually forbidding but exceptionally interesting succulents.

Ten genera are now represented in our Coastal Plain cactus flora. In the aggregate the types present are terrestrial, some-

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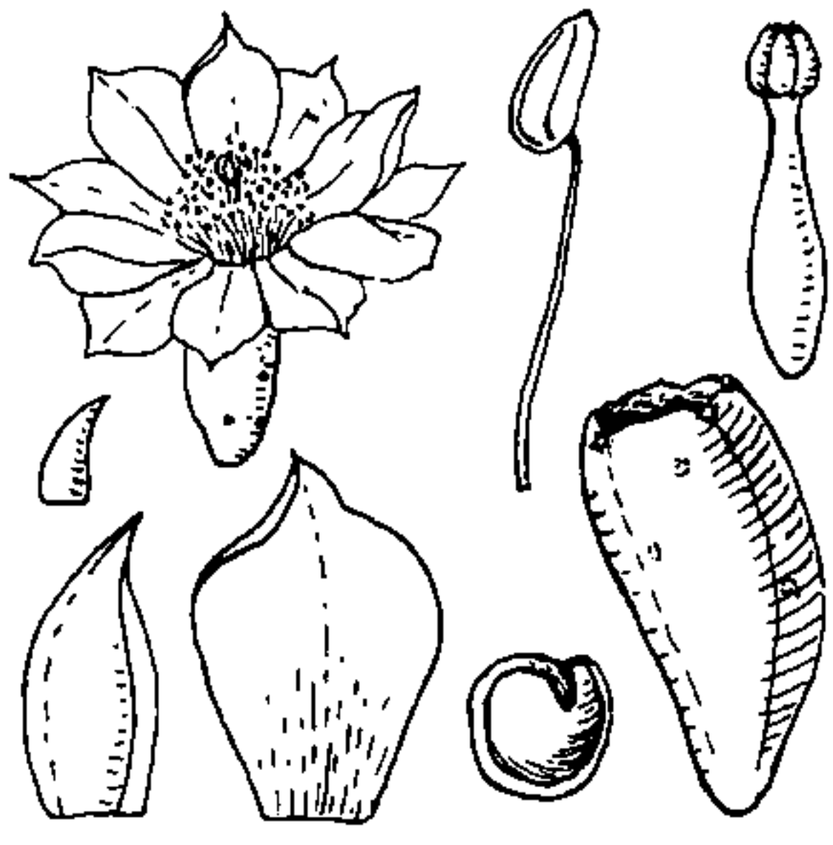
Germany, Holland, and England. In 1735 he received the degree of doctor of medicine in Holland, and made his home in that country for several years. While there he published the details of his artificial system of plant classification, which, with minor modifications, was in general use throughout the botanical world for almost a hundred years. From 1738 to 1741 he practised medicine at Stockholm; for the remainder of his life he was a professor in the university at Upsala, publishing numerous books dealing with botany and zoology; his "Species plantarum," 1753, is now accepted as the starting-point of modern botanical nomenclature. He died at Upsala, 10, January 1778.—J. H. B.

[7] Species Plantarum 466–470. 1753.

[8] John Clayton was born in 1686, at Fulham, Middlesex, England. In 1705 he settled in Virginia, where he was clerk of Gloucester County for fifty years. His botanical reputation rests primarily upon his "Flora virginica," one of the classics of American botany. This was published in Holland, in two volumes, 1739 and 1743, under the editorship of Jan Fredrik Gronovius, and a second edition appeared in 1762, under the supervision of Lorenz Theodor Gronovius. Unfortunately, neither Gronovius had any first-hand acquaintance with Virginian plants, and they introduced many blunders into the manuscript. Clayton devoted himself throughout his long life to the collection and study of the plants of the colony, but his herbarium and notes were destroyed by fire a few years after his death which took place near Williamsburg, Virginia, 15 December 1773. He and his field of labor are both commemorated by the scientific name of the dainty spring-beauty, *Claytonia virginica*.—J. H. B.

times humus-loving, epipetrinous, and epiphytic plants; vines, shrubs, and trees; armed and unarmed plants; leafy and leafless plants; rounded-stemmed, angle-stemmed, flute-stemmed, and flat-stemmed plants. The flowers are white and of all colors except blue, and the fruits are white and of all colors, and nearly all possible shades. The flowers are short-lived, but the fruits are persistent, and are sought by both human and wild life, both of which agents have been active in extending the geographic ranges of many species.



Opuntia Opuntia (L.) Karst.
Flower about ⅓ natural size.

Our oldest cactus, botanically speaking, for 178 years in the records, is *Opuntia Opuntia*.[9] This has the most extensive geographic and altitudinal range of all the eastern cacti. It occurs in all the plant provinces from the Mississippi River to the Atlantic Ocean, ranging from Georgia to Tennessee, Missouri, Illinois, Ontario, and eastern Massachusetts. It has long been naturalized in the mountains of Italy and Switzerland. The various forms in the various provinces resulted in the publishing of it under numerous names. South of the northern end of the Coastal Plain it is now confined to the higher lands and does not otherwise figure in the annals of the Coastal Plain except through error.

This common prickly-pear seems also to have had the longest biological history in our region as well as the longest botanical, for none of the other species show any connection with the ancient highlands. Of course, some of the species may have had ancestors in the primeval plant reservoirs where the plants later became extinct. However, the species are of tropical American types and the plants are tender as regards low temperatures. Either their ancestors were not hardened by the cold of the Ice Ages or they represent a later invasion from the south. Some of

[9] *Cactus Opuntia* L. Sp. Pl. 468. 1753. *Opuntia Opuntia* Karst. Deutsch. Fl. 888. 1882. *Opuntia compressa* Salisb. Prodr. 348. 1796. *Opuntia vulgaris* Authors, not Mill. 1768.

the plants will endure frost with impunity, but not as a rule freezing weather in the East. The one typically southern species, *Opuntia Pollardi,* which has ventured as far north as Delaware, at least, does not appear at all happy north of South Carolina, even though the temperature of its habitats may be tempered as a result of the proximity of large bodies of water.

After several feeble beginnings at collection and study, terminating a generation or two ago, that most outstanding group of American succulents, the Cactus family, was neglected—and apparently is still shunned. Could it have been that botanists were too sensitive to handle the more or less irritating armament of these plants?

A few years ago the kinds of cacti recognized as growing naturally in the eastern Coastal Plain could almost be counted on the fingers of one hand. Today, following some studies based on explorations and investigations in the field, we can confidently enumerate the kinds of cacti now growing naturally in the Coastal Plain—from Nantucket Island to Dry Tortugas—up to forty-four!

The revival of interest in the cacti of the Coastal Plain was brought about early in this century during the preparation of the manuscript for the cactus monograph which was made possible by the patronage of the Carnegie Institution of Washington and of Nathaniel Lord Britton,[10] then Director-in-Chief of The New York Botanical Garden.[11]

[10] Nathaniel Lord Britton was born 15 January 1859, at New Dorp, Staten Island, New York. Trained as a mining engineer, and graduating from Columbia University with the degree of E.M. in 1879, his scientific work was at first in geology. His early interest in the flora of Staten Island, however, expanding into a critical knowledge of the flora of the northeastern United States, determined the direction of his life-work. He organized the department of botany of Columbia Univeristy, and upon the establishment of the New York Botanical Garden, largely through his efforts, his selection as its director-in-chief was inevitable. This post he filled for more than thirty years, until 1929. His innumerable publications have made his reputation world-wide. He died in New York City, 25 June, 1934. –J. H. B.

[11] The Cactaceae. By N. L. Britton and J. N. Rose.—A monograph of the Cactus family with descriptions and illustrations in color and in black and white, in four quarto volumes. Published by the Carnegie Institution of Washington, 1919–1923.

LOCATION OF SPECIES

Cacti are typically warm-climate plants, but a few kinds in the north temperate zone (including two of the Coastal Plain species, *Opuntia Opuntia* and *Opuntia Pollardi*) will sometimes withstand freezing weather. In the East only one genus, *Opuntia,* has a decided northward extension of geographic range. Where the Coastal Plain runs out under the sea, leaving Nantucket and Long Islands exposed, a single species, the one that is generally accepted as the type of the genus (*Opuntia Opuntia,* 1882),[12] which started out as *Cactus Opuntia,* 1753), appears. Thence southward we get a gradual crescendo which ends in a grand crash, musically speaking, in Florida. In southern New York and New Jersey this typical *Opuntia* also appears, and an additional species thrives in parts of the pine-barrens of southern New Jersey. This latter plant represents, apparently, the northern geographic limit of a southern species—*Opuntia Pollardi*—growing in a region where other southern plants are plentiful. After crossing Delaware Bay we find a single species—again *Opuntia Pollardi*—rather widely distributed in the state of Delaware. Of course, political divisions or states do not necessarily mean much in plant-geography, yet we are more or less interested in the floras of the different states, and their natural or even arbitrary lines of division sometimes are of convenience, especially in picturing geographic distribution to ourselves.

The Coastal Plain of Maryland repeats the cactus flora of Delaware and, as far as we now know, that of Virginia likewise repeats the cactus growth of the adjoining state, and consequently that of Delaware too. Passing southward from the "Northern States" into the "Southern States," *Opuntia Pollardi* (1908) appears locally in the northeastern corner of North Carolina.

Naturally, as we proceed south of the apparently far-reaching climatic influence of the Cape Hatteras region, we should expect to find an increase in the cactus growth, both numerically and specifically, and we are not disappointed, for not fewer than two additional species of *Opuntia* have so far been found in the North Carolina coastal region, one of them introduced, the other native.

[12] This species has a wide geographic range. In addition to the northern part of the Coastal Plain, its range extends into the Piedmont Plateau and the Blue Ridge.

The former, *Opuntia cantabridgensis* (1903),[13] is a native of Mexico, but curiously enough it was described from plants growing in the botanical garden of Cambridge, England, whence its specific name, at a time when its nativity was not known. The latter is *Opuntia Drummondii* (1846),[14] representing the northern known geographic limit of the loose-jointed cactus group collectively termed *Curassavicae,* popularly known as "joe-jumpers," typically West Indian in distribution.

Crossing into South Carolina, we are convinced that the cacti feel the effect of the increasingly more genial southern clime. Also, there seems to have been some incentive for botanists to try to interpret the cacti of that region taxonomically, a condition largely lacking northward in the Coastal Plain.

Stephen Elliott[15] accounts for only one species of *Opuntia,*[16] but records:

"It is possible that there are now three distinct species on the sea coast of the Southern States covered under this name [*Cactus Opuntia*]. In the supplement to this work, if I should be permitted to complete it, the inquiry shall be resumed."

The task of continuing the study fell to the lot of a fellow citizen of a younger generation, Lewis R. Gibbes.[17] In 1858 he

[13] *Opuntia cantabridgensis* Lynch, Gard. Chron. III. **33**: 96. 1903.

[14] *Opuntia Drummondii* Graham, in Maund, Botanist **5**: *pl. 246.* 1846.

[15] Stephen Elliott was born 11 November 1771, at Beaufort, South Carolina. He was a graduate of Yale (1791), eminent in the history of South Carolina as member of the legislature and state senator, and as president of the State Bank for nearly twenty years. He was the author of a remarkable work modestly entitled by him a "sketch" of the botany of South Carolina and Georgia, although it filled two thick volumes and is a treasury of original observations. He died at Charleston, which had long been his home, 28 March 1830. His herbarium is now preserved at the Charleston Museum.—J. H. B.

[16] A Sketch of the Botany of South Carolina and Georgia 1: 537–538. 1821.

[17] Lewis Reeve Gibbes was born 14 August 1810, at Charleston, South Carolina. He was a graduate in medicine, but professionally a teacher throughout his long career, being a member of the faculty of the College of Charleston for fifty-five years. He published but little, but was both mathematician and naturalist, and his ability as a botanist was well known and widely recognized. He died at Charleston, 21 November 1894. His herbarium is now incorporated with that of the New York Botanical Garden.—J. H. B.

reported the results to the Elliott Society of Natural History and in the following year published his notes in the Proceedings of that society.[18] Four species were indicated. They follow here with their equivalent cited in cases where the Gibbes species are synonyms of former described species:

(1) *Opuntia tunoidea* Gibbes (1859);[19] (2) *O. macrarthra* Gibbes (1859);[20] (3) *O. vulgaris* = the *Cactus Opuntia* of Elliott's work = *O. Pollardi* (1908); (4) *O. frustulenta Gibbes* (1859)[21] = *O. Drummondii* (1846). Thus there are four kinds of native prickly-pears in South Carolina, two of them the same as two of the native North Carolina species—*Opuntia Pollardi* (1908) and *Opuntia Drummondii* (1846)—another which ranges southward into Florida—*Opuntia tunoidea* (1859)—and still another, an endemic species—*Opuntia macrarthra* (1859), a native of the South Carolina coast.

South of the Savannah River, in Georgia, we again find four species representing the genus *Opuntia,* the two more common species having been already recorded for the two Carolinas—*Opuntia Drummondii* and *Opuntia Pollardi.* The two additional cacti are respectively related to the two species just mentioned. The one, *Opuntia Tracyi* (1911)[22] is a joe-jumper closely related to *Opuntia Drummondii,* while the other, *Opuntia stricta* (1812)[23] is related to *Opuntia tunoidea.*

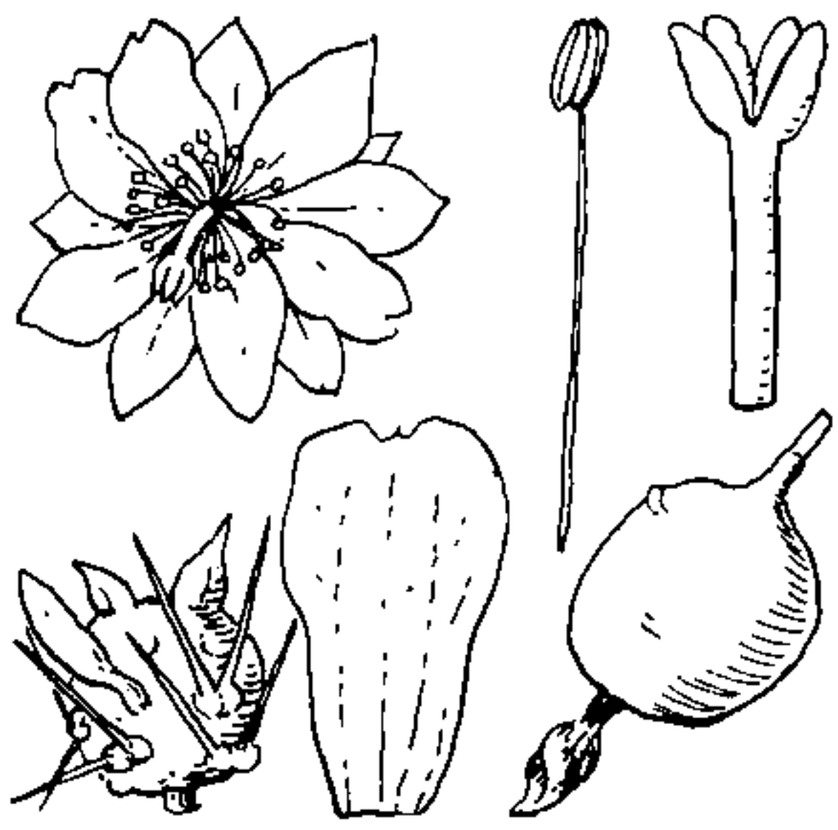
Thus it takes but little time and space to dispose of the nine species of *Opuntia* or the nine kinds of cacti growing naturally north of the Saint Mary's River.

The political boundary between southeastern Georgia and northeastern Florida, the Saint Mary's River, happens to be a natural plant-barrier at least in the case of cacti. South of the river we find the peninsular state, comprising the southern extremity of the Coastal Plain, the home *par excellence* for cacti east of Texas.

The southern tip of the continental shelf supports what we know as peninsular Florida. For ages siliceous sands, one of the

[18] Proceedings of the Elliott Society of Natural History 1: 272–273. 1859.
[19] *Opuntia tunoidea* Gibbes, Proc. Elliott Soc. 1: 272. 1859.
[20] *Opuntia macrarthra* Gibbes, Proc. Elliott Soc. 1: 273. 1859.
[21] *Opuntia frustulenta* Gibbes, Proc. Elliott Soc. 1: 273. 1859.
[22] *Opuntia Tracyi* Britton, Torreya 2: 152. 1911.
[23] *Opuntia* (*Cactus* 1799) *stricta* Haw. Syn. Pl. Succ. 199. 1912.

products of the disintegrating granite, sandstones, and other rocks of the Piedmont and the Blue Ridge, were carried southward and deposited toward the end of the continental shelf. The structure and position of peninsular Florida, the present more elevated portion or backbone of the continental shelf—really a great sandbar extending southward several hundred miles into warm seas—indicate a unique plant-covering. In the case of the cacti we are not disappointed, for Florida, although far separated from any region that could be considered a cactus country, can, nevertheless, boast of nearly four dozen species of these interesting succulent plants. The great majority of them are native plants, while only nine are naturalized kinds from insular and continental tropical or warm-temperate America. The Florida cacti are included in ten different genera, as the family is now generically divided, and they represent great diversity in form. About two-thirds of the species, however, are conspicuously flat-jointed and scaly-leaved kinds; the others are mainly of the columnar or prismatic types and likewise nearly or quite leafless. One genus, *Pereskia,* naturalized from tropical America, is represented by a foliaceous vine.[24]



Pereskia Pereskia (L.) Karst.
Flower about ½ natural size.

About two dozen of the total number of species in Florida are endemic. Six of these are confined to the Keys of the Florida reef, while twelve are peculiar to the Florida peninsula and its contiguous islands or offshore bars. Five species grow naturally both on the keys and on the mainland, while six have geographic ranges that extend either into other States or into continental and insular tropical America.

There are evidences that the present cacti of Florida and the contiguous territory are directly or indirectly the remnants of one-time larger cactus developments.

[24] *Pereskia* (*Cactus* L. 1753) *Pereskia* Karst. Deutsch. Fl. 888, 1882. *Pereskia aculeata* Mill. Gard. Dict. Ed. 8, 1768.

(*To be continued*)

12

IBOZA RIPARIA

The Christmas exhibit in the Display Greenhouse at Conservatory Range No. 1 included a number of plants of *Iboza riparia.* This plant bears a profusion of small creamy-white flowers arranged in loose graceful panicles and it associated well with taller plants of the scarlet-flowered *Plumbago indica* var. *coccinea.*

To the gardener with cool greenhouse facilities available, the Iboza should commend itself as an addition to the list of decorative subjects cultivated for winter bloom, for it is relatively easy to handle, and thrives well if given reasonably good conditions and care. As is the case with so many greenhouse perennials, old plants grown on do not produce satisfactory results and a fresh stock should be raised each year. Cuttings rooted in March or April and stopped once during the growing season will make fine specimens in eight- or nine-inch pots, while a later batch inserted in early June and permitted to grow on without stopping will produce useful material in pots six inches in diameter.

Growing conditions identical with those usually accorded chrysanthemums will suit *Iboza riparia* throughout the spring and summer months but after the end of September it should be accommodated in a greenhouse having a night temperature of not less than fifty degrees. Good drainage, firm potting in a rich soil and liberal supplies of water when the pots are well filled with roots are important cultural details, and the grower should remember that this plant is a gross feeder that requires liberal applications of dilute fertilizers during the latter stages of its growth. After they have passed out of bloom the plants should be cut partly back and be placed in a cool house with the soil maintained on the dry side. Two or three weeks before the time is at hand to take the first cuttings a little of the surface soil should be removed and replaced with a light rich mixture. The plants may then be introduced to a somewhat warmer temperature and should be sprayed lightly with clear water on all favorable days to encourage the production of new growth. Full exposure to sunshine is very necessary at all times.

Iboza riparia belongs to a genus endemic to Africa and seems to be the only representative of it in cultivation. Even so, it is not common in gardens and when grown it is usually found under the

A five-foot specimen of *Iboza riparia* which bloomed during the holiday season.

name *Moschosma riparium,* although N. E. Brown states that it "differs entirely from the genus *Moschosma* in habit, calyx, and corolla, and in having unisexual flowers with the sexes on different plants." Well-grown specimens attain a height of four or five feet and are of branched habit. The leaves are opposite, broadly ovate, and toothed. Like the stems they are slightly viscid and emit a distinctive but inoffensive odor if brushed against. The flower panicles are from one to two feet in length and consist of a great number of tiny flowers, creamy-white in color with conspicuous dark anthers in the male form.

Although of little value as a cut flower this Iboza when in bloom can be used successfully as a decorative house plant and will remain attractive for one or two weeks, according to the position it is accorded.

T. H. Everett.

EVENING COURSE IN GARDENING PRACTICE OFFERED THIS WINTER

Increased interest in plant culture on the part of people who devote time and attention to their own gardens has led to the offering of a special course of instruction in gardening practice this winter by The New York Botanical Garden. The six weekly lectures which will comprise the course will be entirely free to members of the Garden.[1]

Clubs which are members of the institution may delegate three of their members to attend. Non-members will be admitted upon payment of a fee of six dollars for the course. Or, better still, they may subscribe to a membership in the Garden, and thus avail themselves of the other advantages offered.

The lectures will be given at the Eastview Avenue Junior High School, at Main Street east of Broadway in White Plains—a point selected for its convenience for Westchester, Putnam, and Fairfield County members. If the course meets with a ready response,

[1] Members of the Garden are entitled to attend other courses offered to the full value of their membership fee. This new course in gardening practice, however, is given as an additional service without deduction from the membership credit.

it is hoped to repeat it at centers accessible to members living in other sections.

The series opens Tuesday, January 29, at 8 P. M. The lectures, which will be given by Mr. T. H. Everett, will last approximately one hour and will be followed by forums for the discussion of individual problems in gardening. It is expected that other members of the staff will be present from time to time to give advice during the forum discussions. Specially prepared slides showing actual gardening operations and how to perform them will be used to illustrate the lectures. An outline of each subject covered will be distributed at each session.

As now planned—though the exact prospectus is not final the lectures will deal with the following subjects:

Lecture I.—Soils and Their Preparation

January 29. A discussion of the various methods of working the soil to bring about an improvement in its fertility, including digging, double-digging, trenching, forking, fertilizing, and composting, and making special mixtures for rock gardens, seed-flats, pot plants, etc.

Lecture II.—Seeds, Seed-sowing, and the After-care of Seedlings

February 5. Illusrating methods of sowing seeds out of doors, in frames, and in the greenhouse or window garden, followed by suggestions for the care of the young seedlings.

Lecture III.—Vegetative Propagation

February 19.[2] This lecture deals with the many ways of raising plants otherwise than from seeds, as by cuttings, leaf-cuttings, root-cuttings, budding, grafting, layering, division, etc.

Lecture IV.—Planting, Watering, and Feeding

February 26. These three most important phases of garden routine will be dealt with in a practical manner.

Lecture V.—Pruning and Training

March 5. Will deal with spur pruning, summer pruning, root pruning, shearing, etc.

Lecture VI.—Cultivation and Mulching and Winter Covering

March 12. A discussion of various methods of conservation of moisture in the soil by surface cultivation and by mulching, also methods of winter protection.

Letters briefly describing the course have been sent to members living within a 35-mile radius of White Plains. Other members—or non-members—are equally welcome, and all those desir-

[2] A holiday will be observed for Lincoln's birthday.

ing to take the course are asked to send their names to The New York Botanical Garden without delay. In case the lecture hall is filled to capacity, registrants will be admitted in the order of their application.

One of the objects of this new evening course is to make available to serious gardeners a definite course of instruction in cultural practice.

PORTO RICO HONORS MEMORY OF DOCTOR BRITTON

A high mountain in Luquillo National Park, Porto Rico, has been named in honor of the late Dr. Nathaniel Lord Britton, who spent parts of many years obtaining material for the Britton & Wilson Botany of Porto Rico and serving as chairman of the committee of The New York Academy of Sciences charged with the Scientific Survey of Porto Rico and the Virgin Islands.

"It is a beautiful spot," writes a correspondent to Dr. John K. Small. "Let us hope some day it will be another Buitenzorg Botanical Garden in his memory, under the American flag and more accessible to nature-lovers than far-away Java."

Another correspondent writes:

"The La Mina Recreational Area is becoming more and more beautiful. There is nothing else like it in the West Indies, if anywhere. We have named a prominent double-topped peak at the head of the basin and dominating it 'Mt. Britton.' We have a lookout tower now on top of Mt. Britton."

Dr. J. A. B. Nolla, Assistant Commissioner of Agriculture and Commerce of Porto Rico, writes to Miss Carol H. Woodward:

"We are very pleased that we have been able to name a mountain in the Luquillo National Forest in honor of the Brittons. I can assure you Mount Britton will be one of the most attractive places of the whole National Forest, and we are hoping that it may become a botanical shrine in the tropics. I have visited this region and find that it is as worthy an honor as Puerto Rico has to offer to her best botanist and friend."

Dr. Nolla encloses a copy of a letter from Mr. William R. Barbour, Supervisor of the Luquillo National Forest, from which the following extract is taken:

"At the time we started our development work in the Luquillo National Forest, in the summer of 1933, Dr. and Mrs. Britton were both alive. A geographical feature can not be named for a living person. Therefore we decided to name the Recreational Area which we were developing in the basin of Río La Mina the N. L. Britton Recreational Area.

At the head of this basin there is a double peak which has never been named and which is a prominent topographical feature. After Dr. and Mrs. Britton both died, we decided to name this peak Mount Britton, and to call the Recreational Area the La Mina Recreational Area. This has been done.

Mount Britton is on the divide between the waters that flow north and south. Its elevation above sea level is about 3200′. From its top is obtainable a very fine view of the mountains, of the Caribbean Sea to the South, and of the eastern end of Puerto Rico. On a clear day one may see the Virgin Islands sixty miles away. We have constructed an excellent trail suitable for horse or foot, to the top of Mount Britton and on the top have erected an observation tower with a shelter under it."

BIRD AND WILD FLOWER SANCTUARY TO BE CREATED AT THE GARDEN

Within a nine-acre area in the woodland between the new rock garden and the iris planting, birds and native flowers and trees will be encouraged and preserved, through the efforts of the New York Bird and Tree Club.

The organization is now raising funds for this new project, which will be established as a memorial to Elizabeth Gertrude Britton. It has been suggested that sections of the fence to be erected early in the spring to enclose the sanctuary be dedicated as memorials to others. The club, of which Dr. Forman T. McLean is president, plans to induce birds to stay over winter by feeding them within the enclosure, and to preserve our native flora by planting wild flowers and trees of the New York region. Mrs. William Wallace Nichols of Scarsdale is chairman of the sanctuary project. The garden is coöperating with the committee aiming to establish this preserve.

WINTER READING FOR GARDENERS

For that period of restless impatience late in winter, when the garden cannot be worked in for an interminable time to come, few things could be more gratifying to the eager gardener than, by pleasant reading, to discover the far-away sources of the many things in his garden.

To learn that the Greek women, mourning the passing of summer, were the first to raise pot-plants, and that these plants eventually gave rise to window-boxes and roof-gardens; to read of the importation of the first chrysanthemums into Europe 250 years ago—and then think of the great variety since developed from these flowers; to be told that the early inhabitants of Mexico, by careful seed selection, are partly responsible for the quality of the corn we eat today; to hear that the early botanist Clusius was the first enthusiast for the sort of alpine plants that we seek for rock gardens now –to discover, in fact, in every paragraph, tales that reveal the long road through the centuries that our garden customs and favorite plants have traveled: that is why Richardson Wright's "The Story of Gardening"[1] makes such excellent reading. Through an entertaining narrative which covers, with a brief glance at important places, nearly sixty centuries, it gives every feature of one's garden new life and personality. In every chapter one sees possibilities for great expansion of the subject, and longs to delve further. An ample bibliography simplifies the search for additional literature.

A few of the topics have been expanded in Mr. Wright's still more recent book, appropriately named "Winter Diversions of a Gardener."[2] It is a lighter book in both weight and content, but none the less good reading. In this he has let his thoughts wander over a few tantalizing subjects which had been barely mentioned in his longer book. So he gives us, after an opening chapter entitled "But why diversions?", lightly informative, often amusing details about such things as "Flower-painting ladies," "Happenings in summer-houses (together with a footnote on al fresco bathing)," "Luggage of traveling plants," "The Huguenot as

[1] Richardson Wright, The Story of Gardening. Pp. 475, illus. Dodd, Mead & Co., New York, 1934. $3.00.

[2] Richardson Wright, Winter Diversions of a Gardener. Pp. 356, illus. Lippincott, Philadelphia, 1934. $2.50.

gardener," and "The parson with the hoe," the last of which is a remarkable revelation of the part played by men of the church in botany and horticulture.

While "The Story of Gardening" is a book one can profitably study, and find study pleasurable, "Winter Diversions of a Gardener" is frankly for entertainment, yet it is packed with good things for the gardener-reader to remember.

CAROL H. WOODWARD.

A NEW FLORA OF WESTERN NEW YORK[1]

Another handsome addition to our list of modern local floras has recently appeared, covering the region around Buffalo and Niagara Falls. In this area 1,587 species and 115 varieties of flowering plants and ferns have been noted. The book is a list, not a descriptive flora, presenting for each species information about its habitat preferences and the various stations where it has been observed. The names used are those of Gray's New Manual, with a few emendations based on Wiegand and Eames' Flora of the Cayuga Basin. This list occupies about two thirds of the book.

Other features of the book are both valuable and highly interesting. A chapter of 38 pages describes the vegetational features of the region and is well illustrated. There is a short bibliography. The geology, climate, and floristics of the area are fully discussed. There is a very readable account of recent changes in the plant life caused by deforestation, settlement, and the introduction of foreign species, which now constitute more than a fourth of the total flora. Perhaps most interesting of all is the botanical history, which began with the visit of Peter Kalm in 1750. Later visits of Michaux, Nuttall, and Douglas are described. In 1826 Amos Eaton led a canal-boat excursion of students to the Falls. In the party was G. W. Clinton, parts of whose journal are quoted, with references to his botanical observations and also to the eccentric Rafinesque, whom they met on their return voyage. Clinton later settled in Buffalo and was actively engaged in botanical work for many years.

H. A. GLEASON.

[1] Charles A. Zenkert, Flora of the Niagara Frontier region. Pp. i–x + 1–328, 78 figures, folding map. Published by the Buffalo Society of Natural Sciences. 1934.

VAN LEEUWENHOEK MICROSCOPE, IN REPLICA, PRESENTED TO GARDEN

A replica of an original van Leeuwenhoek microscope is the Garden's latest addition to the collection of historical instruments on display in the Museum Building. It was presented by Dr. P. H. van Cittert of the University of Utrecht, where the van Leeuwenhoek microscope itself is deposited.

Quite different in appearance from even the simplest form of microscope one has seen before, the original of this instrument, nevertheless, has been proved by Dr. van Cittert to give a more perfect magnification than any of the microscopes built for many years thereafter, including the first of the compound microscopes. " . . As regards optical powers," he states, "the 'van Leeuwenhoek' microscope must bave been one of the best microscopes ever made before 1830." That was the year that the compound microscope first acquired sufficient improvements to exceed the simple microscope in usefulness. And van Leeuwenhoek's little instrument was made about 1678! "It is therefore no wonder," continues Dr. van Cittert, "that van Leeuwenhoek, possessing all the qualities of a keen observer, was able, with this instrument, to make such startling discoveries, that up to the present day the scientific world is still amazed at them. Nor is it to be wondered at, that their reliability and correctness were formerly often doubted, for the simple reason that they could not be repeated."

"In short," he says further, "he made his discoveries not *in spite of,* but *thanks to* the fact that he made use of a primitive simple microscope."

This crude, yet remarkable, historic microscope consists merely of two roughly made brass plates less than two inches long and an inch wide, with a hole bored through them to hold the minute lens (0.5 mm. in diameter), and a primitive type of object-holder.

In order to prove the capacity of this unique early instrument, Dr. van Cittert had a lens made of exactly the same size and power, and used it for observation. While it was possible to determine the magnification and accuracy of part of the field of the original, it could not be put to extensive practical use because of scratches on the unprotected side of the lens. With the substitute lens magnifying the objects 270 diameters, numerous bacteria were

observable. Spirilla in canal water could be easily seen; also it was possible to distinguish the cilia of paramecia and of some rotifers,—an observation comparable to that of van Leeuwenhoek himself, when he described protozoa seen in canal water placed under his microscope. Diatoms also show plainly at such a magnification. An illustration of diatoms as seen through a lens of the power of van Leeuwenhoek's is on display beside the model of this very early instrument.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

Recent accessions to the herbarium of The New York Botanical Garden, sent for identification, include 600 specimens of plants from Formosa and the Riukiu (Loochoo) Islands, received from J. Linsley Gressit of Stanford University, about 2,000 specimens from northern Sumatra, received from the collector for H. H. Bartlett of the University of Michigan, and several smaller collections, one from New Britain and Timor, besides a gift of 192 specimens from the Riukiu Islands and Osima, presented by Dr. R. Kanehira.

Professor Y. Yamamoto of the Taihoku Imperial University in Formosa, who was studying the Augustine Henry collection of Formosan plants at the Botanical Garden during the summer, remained here until November, when he left for Washington. After returning here for a short time, and then going to Boston, he plans to sail for Europe to pursue further studies.

The office of Honorary President of the National Plant, Flower and Fruit Guild was conferred upon Dr. E. D. Merrill at the annual meeting of the organization October 25. The purpose of the guild, of which Dr. John H. Finley is President and Mrs. Olive Hyde Foster, Executive Secretary, is to give the unfortunate an opportunity to enjoy the flowers and fruits of those who have gardens and who desire to share.

Dr. Marshall A. Howe, Assistant Director, has been reëlected President of the New York Academy of Sciences.

A delegation of girls from the Walton High School, 184th Street and Creston Avenue, visited the Botanical Garden on December 22, and, accompanied by members of the Garden staff, hung about twenty-five bags of suet for birds on trees in the area southeast of the Iris Garden and Narcissus plantings—in the area selected for the proposed bird sanctuary of the New York Bird and Tree Club.

A modern microscope of the newest design has recently been placed on exhibition among the historical microscopes in the Museum Building. Manufactured by E. Leitz in Wetzlar, Germany, it is a loan from the New York branch of the company at 60 East Tenth Street. The instrument is one that can be used for the highest class of microscopical work. It is equipped with mechanical stage, condenser, and a range of objectives and eyepieces. Placed among microscopes made nearly 200 years ago, it illustrates well the advances made by opticians in reaching the almost perfect instrument of today.

Establishing themselves in Glen Ridge, N. J., as The Plant Doctor, Cynthia Westcott, Ph.D., plant pathologist, and Irene Dobroscky, Ph.D., entomologist, have been serving as professional "physicians" to gardens, greenhouses, and individual plants, for more than a year. Carrying out an idea expressed by Dr. H. H. Whetzel of Cornell University, where they did graduate work, they are offering both diagnostic and complete control service for plants, in the latter case frequently visiting gardens personally twice a week from March to November. While Dr. Westcott directs this new business, Dr. Dobroscky serves in an advisory capacity. Both women have had wide experience in their respective fields, both in this country and abroad.

Dr. Grant D. Darker, Research Associate in the Farlow Herbarium, Harvard University, spent a day at The New York Botanical Garden early in December, looking over certain groups of parasitic fungi in the mycological herbarium. Dr. Darker is continuing the work of Mr. A. B. Seymour, recently deceased, who compiled the Host Index of Fungi of North America.

Dr. E. D. Merrill and Dr. John K. Small were elected honorary members of the Pennsylvania Horticultural Society on November 21.

Dr. M. L. Lohman investigated fungi causing diseases of forest trees in the mycological herbarium at the Garden for a few days in December. He was on his way from the southern Appalachians to New Haven, where he will study results of his summer's work in forest conservation for the Federal Government.

Dr. G. L. Funke, professor in the University of Ghent, who is visiting botanical institutions in the United States, was at the Botanical Garden on October 20.

The Bixby collection of nut trees on Long Island, the largest and finest collection in existence, has been purchased by the United States Government with Emergency Conservation funds, the Department of Agriculture has announced. The collection was started as a hobby by Willard G. Bixby in 1916 and continued to grow both in size and importance until his death in 1933. In a note in the JOURNAL in October, 1933, Dr. Robert T. Morris described this great planting and urged that it be taken over by some one who would carry on the work begun there. The government is transferring the 10,000 trees acquired chiefly to parks and experiment stations. From the latter, it is expected that fine new varieties of nuts will eventually reach the public through commercial channels.

Six decades of the modern era in botanical science were celebrated at the University of Iowa in an extensive scientific program, November 15 and 16. Two symposiums on the teaching of botany; one on the capacity of plant cover to prevent erosion; and one on applied botanical research on maize, comprised the topics of discussion. The printed program contained a portrait of Dr. Charles Edwin Bessey, who served the college from 1870 to 1884.

Dr. N. E. Brown of Kew died November 25 at the age of 85. He had only recently published his latest work, a monograph on the genus *Mesembryanthemum* and the new genera into which it is now split, in collaboration with A. Tischer and M. C. Karsten.

At the regular monthly conference of the Scientific Staff and Registered Students of the Garden, December 14, Dr. E. D. Merrill spoke on the Brass collection of New Guinea plants, which he is now identifying, and Dr. B. O. Dodge reported on "Some Studies of Sterility in *Neurospora*."

Dr. Hamshaw Thomas of Cambridge University, England, who addressed the Torrey Botanical Club in New York December 18, inspected The New York Botanical Garden's collection of fossil plants the following day.

Professor Ralph W. Chaney, paleobotanist, of the University of California, spent some time at the Garden during December, using the reference collections in connection with his study of the Tertiary fossils of the Pacific Coast.

Dr. Carl Skottsberg, Director of the Botanical Garden at Göteborg, Sweden, who is giving a course of lectures at Yale University this college year on the geographic botany of the Pacific Ocean region, is spending his week-ends at The New York Botanical Garden, engaged in studying a collection of marine algae made by him on the Juan Fernandez Islands in 1917.

In addition to those elsewhere mentioned, the following botanists have registered in the library in recent months: Dr. Kate Barber Winton, Wilton, Conn.; Mr. Alain White, Litchfield, Conn.; Dr. Ivan M. Johnston, Jamaica Plain, Mass.; Miss Carrolle E. Anderson, Amherst, Mass.; Prof. L. H. Bailey, Ithaca, N. Y.; Dr. Conway Zirkle and Dr. Edgar T. Wherry, Philadelphia, Pa.; Mr. Edwin B. Bartram, Bushkill, Pa.; Mr. E. P. Killip, Washington, D. C.; Prof. Harold Hume, Gainesville, Fla.; Mr. R. N. Lobdell, Belle Glade, Fla.; Mr. Robert P. St. John, Floral City, Fla.; Mr. Leo R. Tehon and Dr. John T. Buchholz, Urbana, Ill.; Prof. Gilbert M. Smith, Stanford University, Cal.; Prof. W. A. Setchell, Berkeley, Cal.; Miss Clara W. Fritz, Ottawa, Can.; Mr. Ray Jerome Baker, Honolulu, Hawaii; Dr. Nicholas Polunin, Oxford, Eng.; Dr. and Mrs. P. A. Hansen, Copenhagen, Denmark; Dr. P. A. van der Bijl, Stellenbosch, Union of South Africa; Prof. F. A. McClure, and Prof. and Mrs. G. Weidman Groff, Canton, China; and Dr. K. Nakata, Fukuoka, Japan.

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JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

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THE BOTANICAL REVIEW

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NOTES, NEWS, AND COMMENT

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JOURNAL
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VOL. XXXVI FEBRUARY, 1935 No. 422

THE BRITTON HERBARIUM IS ESTABLISHED

In commemoration of the late Dr. N. L. Britton, Director of The New York Botanical Garden from its incipient stages in the last decade of the preceding century until his retirement in June, 1929, at the age of seventy years, the Board of Managers of the Garden, at its annual meeting, held January 14, on motion of Dr. E. D. Merrill, Director, voted that the general herbarium (Phanerogams) of The New York Botanical Garden be henceforth designated as THE BRITTON HERBARIUM, NEW YORK BOTANICAL GARDEN.

The building up of the reference collections was peculiarly close to Dr. Britton's heart and the above action seemed eminently fitting. In Dr. Britton's lifetime he saw the great reference collections of botanical material in New York increased from the nucleus of the Torrey Herbarium of Columbia University, perhaps 400,000 specimens, deposited at the Garden in 1899, to more than 1,700,000, the second largest herbarium in America and one of the great herbaria of the world. Precedents for this action are found in the designation of the fern herbarium of the Garden in 1907 as the "Underwood Fern Herbarium" in honor of Professor L. M. Underwood, and of the moss herbarium of the Garden as the "Elizabeth Gertrude Britton Moss Herbarium" in 1934.

CHRONICLE OF THE CACTI OF EASTERN NORTH AMERICA

(Continued from the January issue)

There is good proof that the Florida region was in recent geologic time much more elevated. This having been the case,

there would have been two warm table-lands, the one represented by the present emerged and less eroded peninsular Florida, the other by the lower and at present submerged Continental Shelf lying off the present coastline of the Florida peninsula. During their aërial existence the surfaces of these regions may have had a series of floristic coverings. Desert condition may have prevailed at one time during which great cactus developments may have existed. When the present Continental Shelf went under the water, its aërial floristics ceased, and were followed by an aquatic flora which came down to us as we find it today. With a lower elevation and with other changes, the cactus flora of the present peninsula began to wane until the cactus arrangement took on its present form.

The more modern botanical history of cacti in Florida dates from the year 1791, when William Bartram[25] recorded[26] and described (1791), though failed to name, a prickly-pear he found growing in northern peninsular Florida. A sporadic reference to prickly-pears in Florida was the describing and figuring of *Opuntia Drummondii* (1846) from plants gathered at Apalachicola.[27]

Nearly a third of the nineteenth century passed before prickly-pears were again associated directly with the flora of Florida. In 1852 Constantine Samuel Rafinesque[28] records that, "having seen in gardens and herbals several rare and new sp[ecies] of Florida, I will here describe some of them."[29]

[25] William Bartram was born 9 February 1739, at the botanic garden of his father, John Bartram (1699–1777), at Kingsessing, near (now in) Philadelphia. He was a clerk in Philadelphia for a few years, and then a merchant in Carolina, but he was an artist of no mean ability, and was more interested in botany than in business. In 1765 he joined his father in exploration in Florida, and was so charmed with the country that when his father returned home the next year he remained as a settler on the St. John's; but a few months later he returned to Kingsessing. From 1773 to 1778 he was engaged in botanical travels in the Carolinas, Georgia, and Florida, of which an account was published in 1791. The rest of his life was spent at Kingsessing, and there he died, 22 July 1823.—J. H. B.

[26] Travels through North and South Carolina, Georgia, East and West Florida, 161. 1791.

[27] The Botanist **5**: *pl. 246*. 1846.

[28] Constantine Samuel Rafinesque was born 22 October 1783, at Galata, the foreign quarter of Constantinople, Turkey, his father being a French

Whatever Rafinesque had in hand or in mind he does not make very clear for the benefit of posterity. In the case of each of the three species he proposed, he involves his own ideas with some previously published matter evidently concerning other kinds of prickly-pears. Recent attempts to associate Rafinesque's name with definite modern collections of prickly-pears do not prove satisfactory.

The first serious attempt to present an interpretation of all the cacti of Florida did not appear until 1860, when Alvan Wentworth Chapman[30] published what he knew of the group in his "Flora."[31]

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merchant and his mother of German parentage. He was educated in Italy, and was a precocious child, early devoting much attention to the natural sciences, particularly botany. He spent three years, 1802 to 1805, in Philadelphia; then lived for ten years in Sicily; in 1815 he returned to the United States, which became his permanent home. He is, in certain ways, the most interesting figure in the history of American botany: brilliant, but eccentric; indefatigable in travel, in study, and in writing, yet never thoroughly completing any line of work without being diverted to some other; snubbed and ignored by his contemporaries, but better appreciated in later years. From 1819 to 1825 he was professor at Transylvania University (now the University of Kentucky), and in that capacity was the first resident botanist west of the Alleghenies. For the remainder of his life his home was in Philadelphia, where he died in an attic, alone and almost friendless, 18 September 1840. It is nearly a hundred years since he passed from the scene, but he is not forgotten. As recently as 1931 there was published "Green River: a poem for Rafinesque," by James Whaler; an epic of nearly three thousand lines, reciting, with the aid of a lively fancy, the vicissitudes in the tragic life of this remarkable man.—J. H. B.

[29] Atlantic Journal 146. 1832. The first species proposed by Rafinesque is *Opuntia* (*Cactus*) *maritima* and is said to grow on the seashore from Florida to Carolina. However, Rafinesque's own reference to a previously published work shows that the name is really founded on a description of Elliott. The second species proposed is *Opuntia* (*Cactus*) *Bartrami* and is founded on the account of an *Opuntia* in Bartram's "Travels." The Bartram plant has not yet been rediscovered. (See Journal of The New York Botanical Garden **20**: 21 & 30. 1919.) A third species proposed is *Opuntia spinalba* founded on a *Cactus Opuntia* of Lunan. It is said to have grown on the Keys of Florida.

[30] Alvan Wentworth Chapman was born 28 September 1809, at Southampton, Massachusetts. He was graduated from Amherst College, where he attended the botanical lectures of Amos Eaton (1776–1842), in 1831, and

In this treatment only six species are accounted for—four of the flat-jointed series and two of the columnar or prismatic types.

Chapman's treatment of the Cactus Family is of little value botanically; but it is enlightening otherwise. It very forcibly illustrates the value, in fact the necessity, of field work in connection with studies in this group, as well as the hopelessness of attempting an interpretation of the genera and species without it. None of the specific names used by Chapman, save one, really belong with Florida cacti. One of the two species which are native and commonly distributed in his home region, Chapman interpreted correctly. The others that grew in a region not visited by him were invariably misinterpreted as to the species, and to a great extent as to the genera of the plants.

Four kinds of the columnar type of cacti had evidently been reported to Chapman, for in a manuscript list[32] prepared in advance of the writing of his "Flora" he has written to the effect that there were four species of *Cereus* on Key West. We have not the least doubt that four columnar, or prismatic, cacti formerly grew on Key West, as they do now on nearly all Keys and in other parts of southern Florida. These represent four different genera, as the family is now divided, namely, (1) *Acanthocereus,* (2) *Hylocereus,* (3) *Cephalocereus,* and (4) *Harrisia.* These were combined by him in the "Flora," variously, under two specific designations wrongly applied—numbers 1 and 2 under the name *Cereus triangularis* (1753), a native species of Jamaica, and 3 and 4 under the name *Cereus monoclonos* (1928), a species supposed to have been discovered in Hispaniola.

Our knowledge concerning the columnar and prismatic types of

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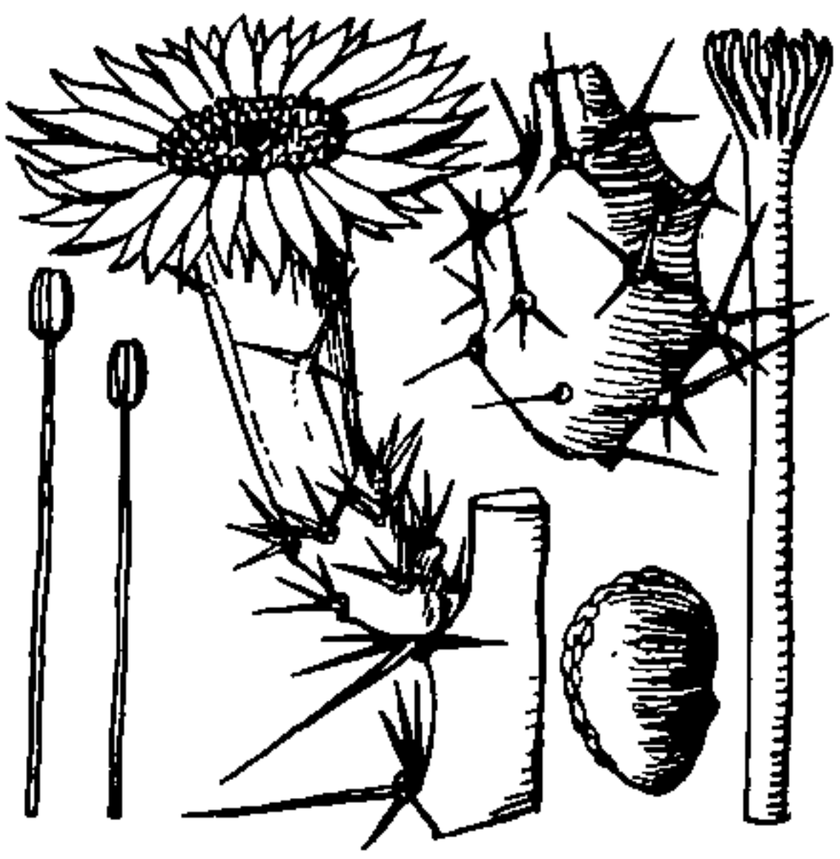
spent the next few years as a teacher in Georgia, where he studied medicine. He removed to Florida in 1835, and from 1847 until his death more than fifty years later he was a physician at Apalachicola. His famous "Flora of the southern United States" first appeared in 1860, and, in its successive editions, remained the standard work of reference for students of the flora of the southeastern states for nearly half a century. He died in his ninetieth year, at Apalachicola, 6 April 1899.—J. H. B.

[31] Fl. S. U. S. 144–145. 1860.

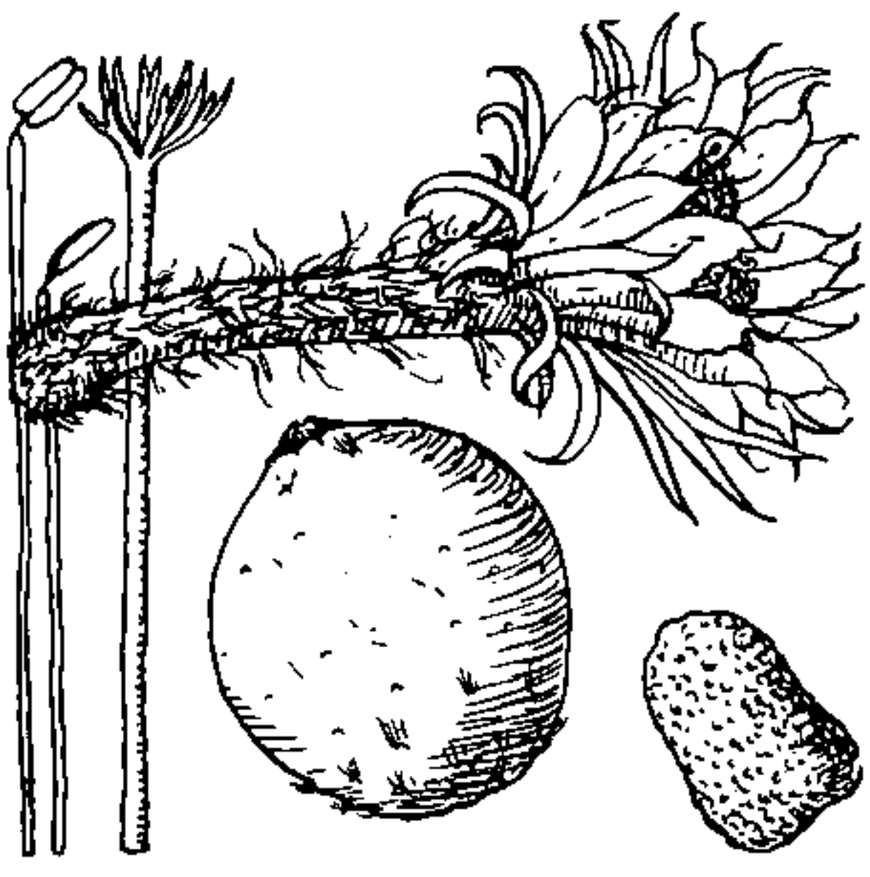
[32] Catalogue of Southern Plants (N. & S. Carolina, Ga. Fla. and Ala.), by Alvan Wentworth Chapman. In the Library of The New York Botanical Garden.

cacti of Florida, additional to those cited in the preceding paragraph, has been accumulated mainly toward the end of the second decade of this century.



Acanthocereus floridanus Small. Flower about ¼ natural size.

There are at least six kinds of columnar-stemmed or prismatic-stemmed cacti native in Florida. They are all hammock-loving plants. The most widely distributed species is the dildoe (*Acanthocereus floridanus,* 1923),[33] a very vigorous recliner. The most widely distributed genus is the prickly-apple (*Harrisia*), represented by stout shrubs which comprise at least three species in isolated regions—*Harrisia fragrans* (1920)[34] in coastal hammocks from Mosquito Lagoon to Saint Lucie Sound; *Harrisia aboriginum* (1920)[35] in coastal hammocks of the Tampa Bay region and southward; and *Harrisia Simpsonii* (1920)[36] in coastal or tidal hammocks of the Cape Sable and Madeira Bay regions and on the Florida Keys. The prickly-apples of several of the Florida Keys exhibit characters that may some time serve to segregate them from the type of the species to which they are now referred and which came from the Cape Sable region.



Harrisia Simpsonii Small. Flower about ¼ natural size.

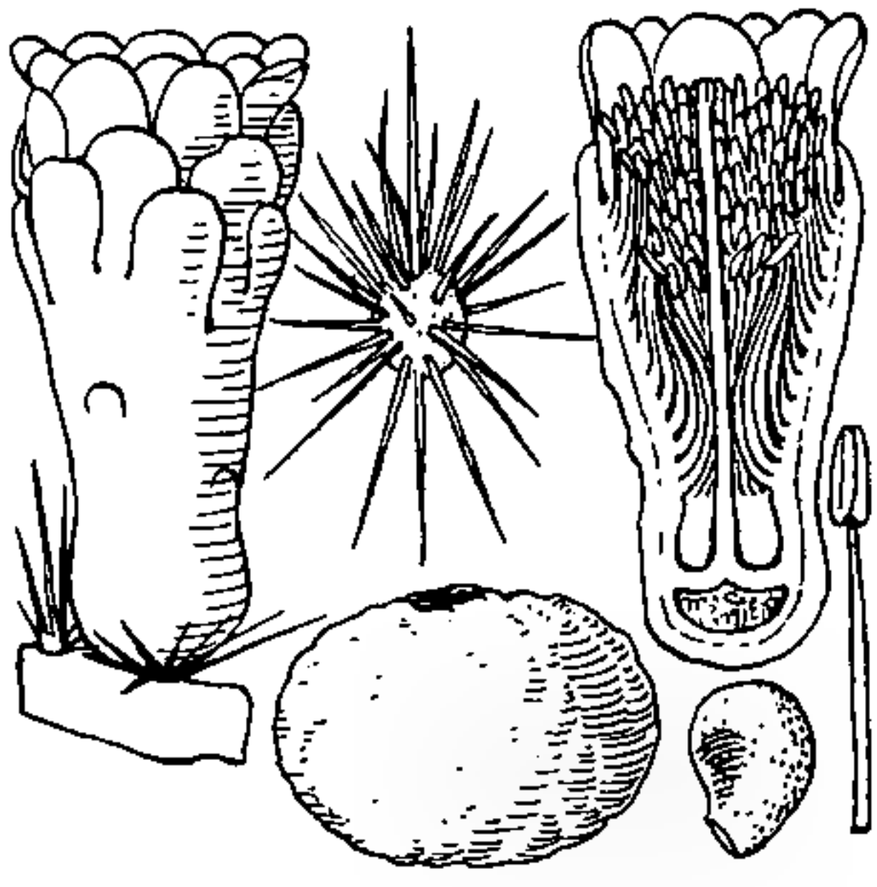
[33] *Acanthocereus floridanus* Small; Britton & Rose, The Cactaceae **4**: 276. 1923.

[34] *Harrisia fragrans* Small; Britton & Rose, The Cactaceae **2**: 149. 1920.

[35] *Harrisia aboriginum* Small; Britton & Rose, The Cactaceae **2**: 154. 1920.

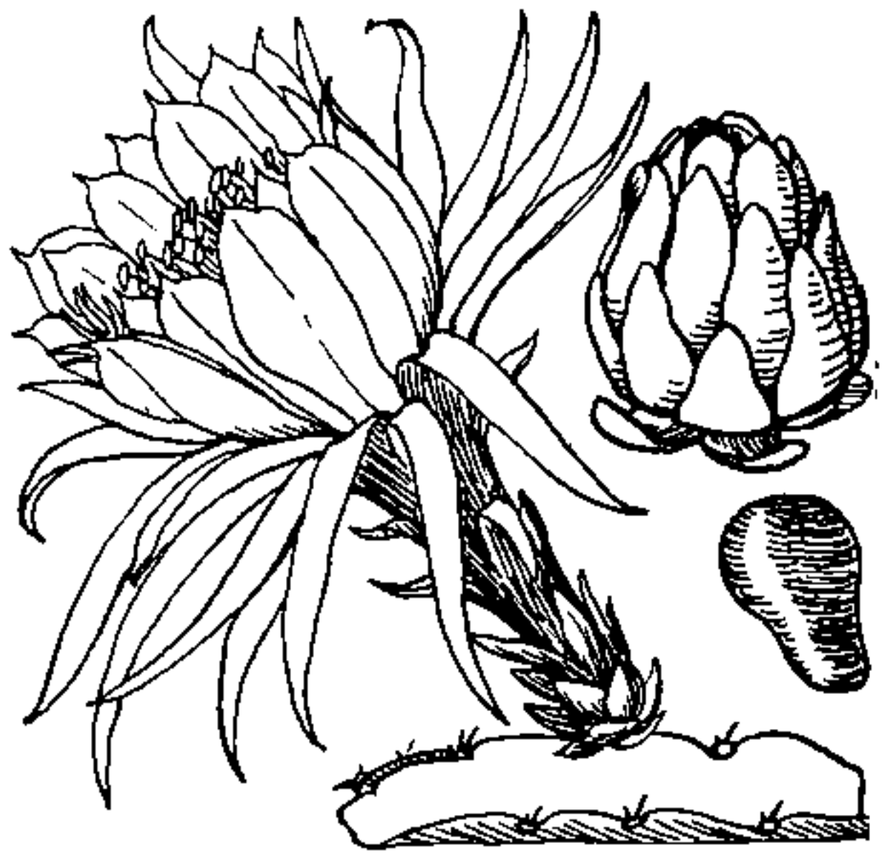
[36] *Harrisia Simpsonii* Small; Britton & Rose, The Cactaceae **2**: 152. 1920.

The cacti with the most restricted geographic range are the tree-cacti of the Florida Keys.[37] One species, *Cephalocereus keyensis* (1909),[38] grows on some of the lower keys, while *Cephalocereus Deeringii* (1917)[39] occupies some of the upper keys. The two species meet on Big Pine Key, where the geologic formation of the upper keys meets that of the lower keys.



Cephalocereus Deeringii Small.
Flower about ½ natural size.

There are four kinds of these long-stemmed cacti naturalized from tropical America. Three of these immigrants have been growing naturally in southern Florida for perhaps nearly a century, while one has been of later introduction. The queen-of-the-night (*Hylocereus undatus,* 1763),[40] the snake-cactus (*Selenicereus pteranthus,* 1834),[41] and the Barbados-gooseberry (*Pereskia Pereskia,* 1753) were introduced and became naturalized in southern Florida as early as Seminole War times.[42] The two latter, however, were not definitely recorded as growing without cultivation in Florida until within the last decade. Another kind of snake-cactus, *Selenicereus coniflorus* (1909)[43] has established itself in late years.



Hylocereus undatus (Jacq.) Britton & Rose.
Flower about ¼ natural size.

The prickly-pears of Chap-

[37] Jour. N. Y. Bot. Gard. **18**: 199–203. 1917.

[38] *Cephalocereus keyensis* Britton & Rose, Contr. U. S. Nat. Herb. **12**: 416. 1909.

[39] *Cephalocereus Deeringii* Small, Jour. N. Y. Bot. Gard. **18**: 201. 1917.

[40] *Hylocereus* (*Cactus* Jacq. 1763) *undatus,* 1834; Britton & Rose, in Britt. Fl. Bermuda 256. 1918.

[41] *Selenicereus* (*Cereus* Link & Otto, 1834) *pteranthus* Britton & Rose, Contr. U. S. Nat. Herb. **12**: 431. 1909.

man's "Flora," interpreted in the present knowledge of specific differentiation, would appear to be "*Opuntia Ficus-Indica*" = *Opuntia keyensis* (1919)[44]; "*Opuntia vulgaris*" = *Opuntia Pollardi* (1908); "*Opuntia polyantha*" = *Opuntia Dillenii* (1819)[45] and *Opuntia tunoides* (1859); "*Opuntia Pes-Corvi*" = *Opuntia Drummondii* (1841), an earlier name for that species.

About the end of the last century John Merle Coulter[46] listed the cacti of the United States,[47] but the article contained nothing additional to our former knowledge of the Coastal Plain cacti.

Selenicereus pteranthus (Link & Otto) Britton & Rose.
Flower about ⅕ natural size.

[42] The lower Indian River or Saint Lucie South region was first settled during or about the thirties of the last century by a colony from Georgia and South Carolina and more northern states, and by a few settlers from Key West. The latter apparently introduced the several tropical American cacti into the hammock south of Fort Pierce. These early settlers were driven away several times by the Indians, but the cacti still flourished, and today appear as much at home as if they were native plants.

[43] *Selenicereus* (*Cereus* Weingart) *coniflorus* Britton & Rose, Contr. U. S. Nat. Herb. 12: 430. 1909.

[44] *Opuntia keyensis* Britton, in Small, Jour. N. Y. Bot. Gard. 20: 31. 1919.

[45] *Opuntia* (*Cactus* Ker. Gawl 1818) *Dillenii* Haw. Suppl. Pl. Succ. 79. 1819.

[46] John Merle Coulter was born of missionary parents at Ningpo, China, 20 November, 1851. Soon after graduation from Hanover College in 1870, he was engaged in botanical field-work in Colorado, for the United States Geological Survey of the Territories, and his flora of Colorado, in collaboration with Thomas Conrad Porter (1822–1901), was published in 1874. In the following year he and a younger brother started, on a small scale, a new botanical magazine; this has developed into the "Botanical Gazette" of today, known to students of plants everywhere. Meanwhile he had become a professor at his alma mater, and from 1879 to 1891 he was on the faculty of Wabash College. After two years as president of Indiana University and three as president of Lake Forest University, he went to the University of Chicago in 1896 as head of the department of botany, and there he remained for nearly thirty years, dearly loved and widely

In 1903[48] the writer recognized five species as growing in Florida, "*Opuntia Ficus-Indica*" (1753); "*Opuntia Tuna*" (1753) = *Opuntia Dillenni* (1819); "*Opuntia austrina,*" (1903) at that time proposed as new; "*Opuntia Opuntia*" (1753) from which *Opuntia Pollardi* (1908) was later segregated; and "*Opuntia Pes-Corvi*" (1856) = *Opuntia Drummondii.* The same number of species we recognized in our second edition with some changes in names.[49]

There has has been a noteworthy increase in the known number of species of these succulents in Florida within the last two decades. Most of the species were brought to light during the several years of botanical exploration by the writer in peninsular Florida and on the Florida Keys.

MODERN HISTORY

The studies connected with the preparation of the monograph, "The Cactaceae," by Nathaniel Lord Britton and Joseph Nelson Rose,[50] referred to above, indicated a lack of knowledge concerning the cacti of the southeastern Coastal Plain, particularly of Florida. Hence short periods for the past few years were devoted to field-work from the Carolinas to the Florida Keys.

Coincident with the completion of the first volume of The Cactaceae we printed a tentative paper on "The Prickly-Pears of Florida."[51] This article set forth our knowledge concerning the

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honored. Upon his retirement in 1925, at the age of 74, he became adviser to the Boyce Thompson Institute of Plant Research, at Yonkers, New York; and there he died, 23 December, 1928.—J. H. B.

[47] Contr. U. S. Nat. Herb. **3**: 355–462.

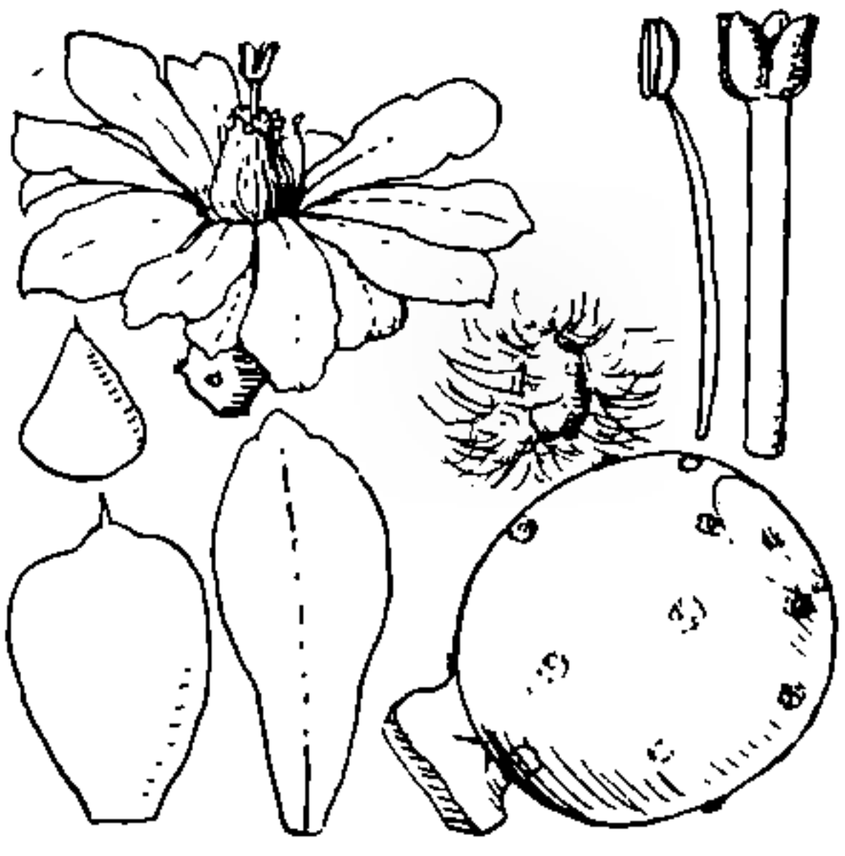
[48] Fl. SE. U. S. 815–816. 1903.

[49] Fl. SE. U. S. ed. 2, 817–808. 1913.

[50] Joseph Nelson Rose was born 11 January 1862, at Dunlapsville, Union County, Indiana. A graduate, in 1885, of Wabash College, which afterward conferred upon him the degrees A.M., Ph.D., and LL.D., he there came under the influence of John Merle Coulter, and they collaborated in much of their botanical work in later years. In 1888 he was appointed an assistant in the division of botany of the United States Department of Agriculture, and in 1894 was transferred to the National Museum, where he was in charge of the United States National Herbarium for many years. His botanical publications were numerous and important, especially those relating to the Umbelliferae, the Crassulaceae, and the Cactaceae. He died at Washington, D. C., 4 May 1928.—J. H. B.

[51] Jour. N. Y. Bot. Gard. **20**: 21–39. 1919.

genus *Opuntia* in Florida up to that time. Eleven species were there recognized: (a) the five kinds formerly recorded for the state, with a somewhat revised nomenclature; (b) *Opuntia Pollardi* (1908), recorded for the state for the first time; (c) *Brasilopuntia brasiliensis* (1933)[52] an additional naturalized plant; four species proposed and described for the first time, namely: *Opuntia lata* (1919) of the lime-sink region; *Opuntia ammophila* (1919)[53] of the "scrub"; *Opuntia keyensis* (1919) and *Opuntia zebrina* (1919)[54] of the Florida Keys and the Cape Sable region.



Brasilopuntia brasiliensis (Willd.) Small.
Flower about ½ natural size.

In the meantime *Opuntia Bentonii* (1912),[55] a species ranging across the northern Gulf Coast region from Florida to Louisiana, was described.

As exploration was prosecuted on a more extended scale, and unfrequented and hitherto botanically unknown regions were visited, the localization of cactus centers in the state became more apparent.

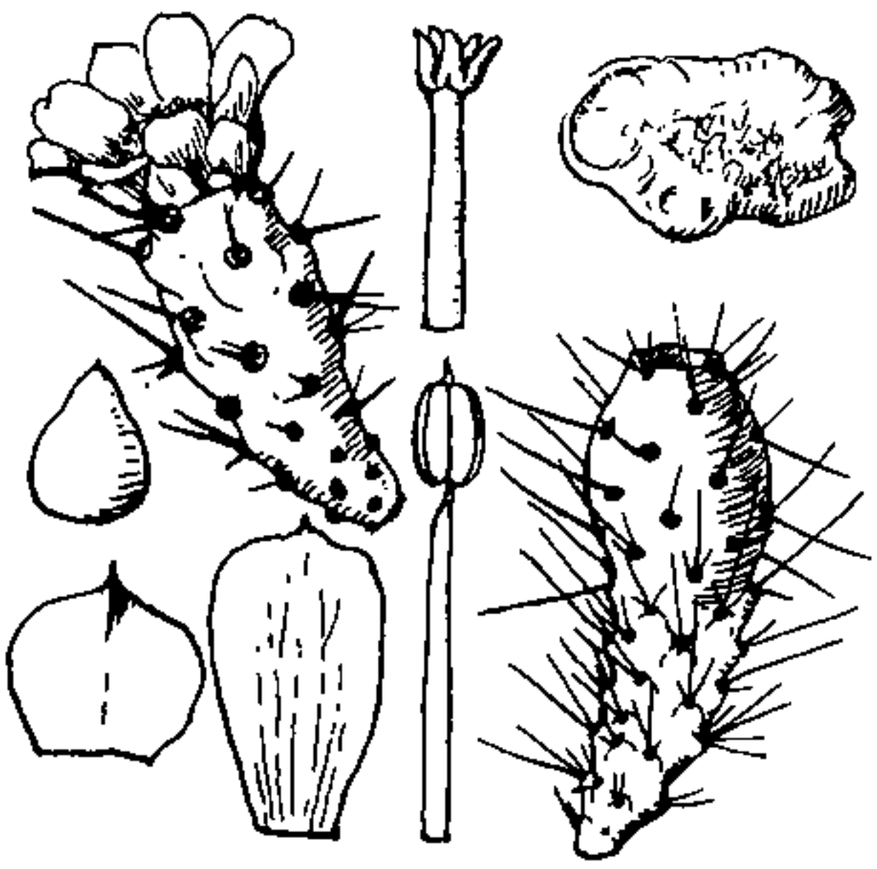
Prickly-pears were found to be widely distributed over the Florida peninsula, but in certain parts they are developed to a remarkable extent. Whether *Opuntia* represents an increasing type of vegetation or a vanishing type in Florida, we are not now prepared to say definitely.

In the vicinity of the estuary of the Saint John's River we found eight species—three formerly described, *Opuntia Drummondii, Opuntia Pollardi, Opuntia Dillenii ?,* and five then undescribed species, namely: *Opuntia magnifica,*[56] *Opuntia polycarpa,*[57] *Opuntia turbinata,*[58] *Opuntia pisciformis* (1923),[59] *Opuntia impedata* (1923).[60]

[52] *Brasilopuntia* (*Cactus* Willd. 1813) *brasiliensis* Small, Man. 911. 1933.
[53] *Opuntia ammophila* Small, Jour. N. Y. Bot. Gard. **20**: 29. 1919.
[54] *Opuntia zebrina* Small, Jour. N. Y. Bot. Gard. **20**: 35. 1919.
[55] *Opuntia Bentonii* Griffith, Rep. Mo. Bot. Gard. **22**: 25, *pl. 1, 2.* 1912.
[56] *Opuntia magnifica* Small, Man. 910. 1933.
[57] *Opuntia polycarpa* Small, Man. 906. 1933.
[58] *Opuntia turbinata* Small, Man. 910. 1933.

In the Halifax River–Mosquito Lagoon region *Opuntia polycarpa* is repeated on the coastal dunes. In addition, there occur there two additional species, *Opuntia nitens*[61] and *Opuntia turgida* (1923).[62]

The Cape Sable–Ten Thousand Island region later yielded three endemic species—*Opuntia eburnispina* (1923)[63] of Cape Romano, *Opuntia atrocapensis*[64] of the Cape Sable region, and *Opuntia ochrocentra* (1923)[65] and *Opuntia zebrina* (1919) both common to the two capes just mentioned and also the lower Florida Keys.



Consolea corallicola Small. Flower about natural size.

The Florida Reef with its already known remarkable cactus growth yielded additional species in two genera. They included *Opuntia tenuiflora*[66] of the upper Florida Keys and *Opuntia abjecta* (1923).[67] In this connection may also be mentioned *Opuntia ochrocentra* and *Opuntia zebrina* referred to in the preceding paragraph.

The additional genus to appear on the Florida Keys was a semaphore cactus, *Consolea corallicola* (1931),[68] an endemic common to the hammocks of both the upper and the lower keys.

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[59] *Opuntia pisciformis* Small; Britton & Rose, The Cactaceae **4**: 256. 1923.

[60] *Opuntia impedata* Small; Britton & Rose, The Cactaceae 4: 257. 1923.

[61] *Opuntia nitens* Small, Man. 906. 1933.

[62] *Opuntia turgida* Small; Britton & Rose, The Cactaceae **4**: 265. 1923.

[63] *Opuntia eburnispina* Small; Britton & Rose, The Cactaceae **4**: 260. 1923.

[64] *Opuntia atrocapensis* Small, Man. 905. 1933.

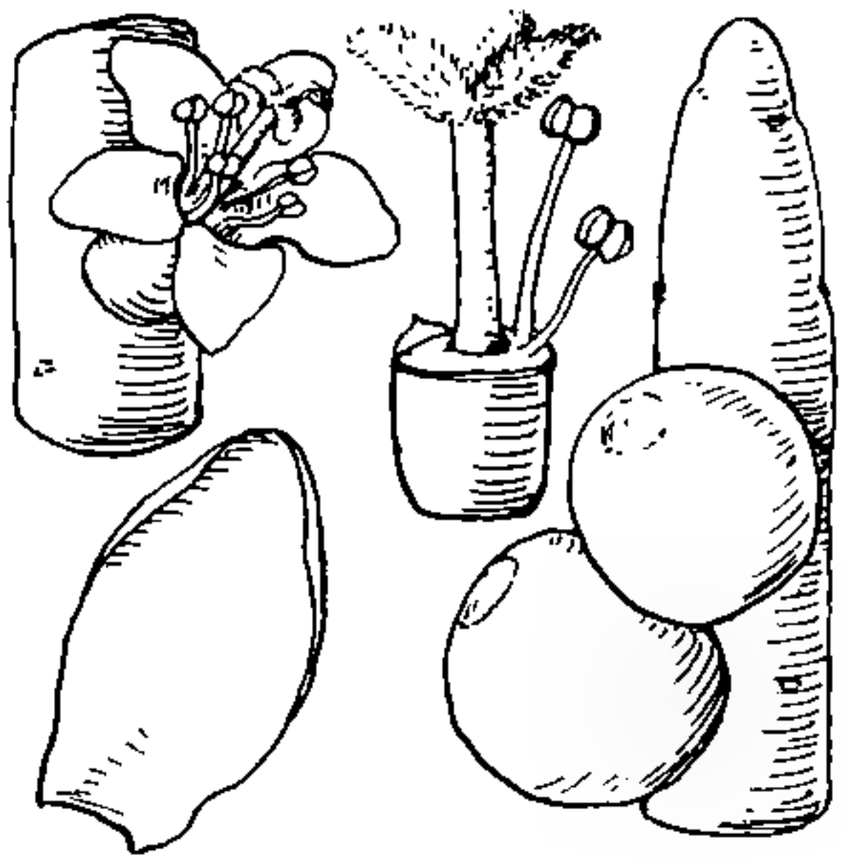
[65] *Opuntia ochrocentra* Small; Britton & Rose, The Cactaceae **4**: 262. 1923.

[66] *Opuntia tenuiflora* Small, Man. 908. 1933.

[67] *Opuntia abjecta* Small; Britton & Rose, The Cactaceae **4**: 257. 1923.

[68] *Consolea corallicola* Small, Addisonia **15**: 25, *pl. 493*. 1931.

The latest addition to the native cactus flora was the remarkable mistletoe-cactus (*Rhipsalis Cassutha,* 1783).[69] This epiphyte occurs on the oak-trees in the hammocks of the Everglade Keys.



Rhipsalis Cassutha (Lam.) Gaertn. Flower about 5 times natural size.

Naturalized species of the prickly-pear group of cacti are not wanting in Florida. The "spineless cactus," the Indian-fig (*Opuntia Ficus-Indica,* 1768)[70] has been established about gardens and settlements for many years. Likewise Aaron's-beard (*Opuntia leucotricha,* 1828)[71] became established in the hammocks bordering Saint Lucie Sound in the earlier half of the past century. Of more recent introduction are the Texano-Mexican prickly-pears (*Opuntia Lindheimeri,* 1850),[72] and the Brazilian tree-cactus (*Brasilopuntia brasiliensis*) which escaped from cultivation in the lower Florida Keys as well as in the upper eastern coastal region referred to on a preceding page.

The disconnected geographic ranges of the genera and species of cactus in Florida and the localization of many of the species might be indicative of a former more prolific cactus development. Perhaps, when the Florida Peninsula at no remote age, geologically speaking, was more elevated and consequently larger, and favored with a warmer climate, the cacti were represented by a greater diversity of plants. If there existed a high sandy plateau rich in cacti our present genera and species may be the descendants of the remnants of such cacti as were not drowned out along the coastline nor frozen out in the interior when the land partly subsided and the climate became cooler.

Even as it is now, however, the existing cactus flora of the peninsula is comparatively prolific and very interesting. We have

[69] *Rhipsalis* (*Cactus* Lam. 1783) *Cassutha* Gaertn. Fruct. Germ. **1**: 137. 1788.

[70] *Opuntia* (*Cactus* L. 1753) *Ficus-Indica* Mill. Gard. Dict. ed. 8. no. **2**. 1768.

[71] *Opuntia leucotricha* DC. Mem. Mus. Paris **17**: 119. 1828.

[72] *Opuntia Lindheimeri* Engelm. Bost. Soc. Nat. Hist. **6**: 207. 1850.

a fairly complete knowledge of the cacti of the interior of the peninsula, but, strange as it may seem, most of the extensive coastlines and the lower Florida Keys are still to a great extent *terra incognita.*

To understand satisfactorily the cacti, especially the specific differences and natural habits, they must be studied in the field, where several or even hundreds of individuals of the same species and often different species, and even those of different genera, can be observed as they grow in their native haunts where they are naturally quite at home.

Under glass and out of their latitude and longitude, these plants not only seldom thrive, but rarely give any idea of their natural habit of growth, and often produce more or less abnormal vegetative parts and aberrant flowers and fruits. However, in the case of such a large group with such a wide geographic distribution, the glass conservatory often becomes a necessity. An out-door plantation in a mild climate with generous plantings presents advantages second to the native field.

JOHN K. SMALL.

PRAYING MANTIDS AT THE GARDEN[1]

Praying mantids again last summer kept the hardy chrysanthemums and other plants at The New York Botanical Garden quite free from insect pests. It was scarcely expected that they would survive the low temperatures of the preceding winter, for their original home is in a much warmer climate.

But about midsummer, half-grown insects began to appear again on the chrysanthemums, despite the fact that the whole border had been moved from a point northwest of the Museum Building to a new site near Conservatory Range 1. A few mantids appeared on other plants too, but they seem to have a special preference for the chrysanthemums.

Mantids had been known for quite a few years in gardens around Washington and Philadelphia, but none, so far as is known, had ever deliberately ventured as far north as New York. So The New York Botanical Garden gladly accepted a gift of a number

[1] Illustrations by courtesy of *Nature Magazine.*

FIGURE 1. Mass of eggs laid in shrubbery by the praying mantis.

of egg masses from the American Museum of Natural History in the spring of 1916.

The egg masses were planted in the shrubbery around the lake north of the Museum Building, but they mysteriously disappeared before the month of May was out. An additional gift of eggs was therefore accepted, and these were apparently kept indoors until the young mantids hatched. The tiny insects were then carried out to the shrubbery where they could satisfy their ravenous appetites with other living insects.

Even the baby mantids are quick to catch their prey. Writing in *Nature Magazine*,[2] Walter F. Shenton, who has raised mantids from eggs in his house, describes their agile movements. Resting upon a leaf in a posture in perfect imitation of their elders—even though there are no elders around for them to mimic—they thrust out their two front claws in less time than their motions can be calculated, and lustily devour whatever live food they can catch. They grow fast, and shed skin after skin, until about mid-July, when their wings develop, they appear quite grown-up. When full

[2] October, 1933.

grown, they are from three to four inches long, and may be either green or brown.

The praying mantis is one of the best friends of the gardener—better than any commercial insecticide known, some say. But he is not yet plentiful. Though it is now more than 18 years since the first egg masses were hatched at the Botanical Garden, only a few of the insects are seen each summer. Some eggs, it is known, did not survive last winter's cold, so it seems likely that death comes each year to many mantids before they hatch in spring, but some at least, are able to survive.

Whether the mantis has many enemies is not generally known. A sparrow, however, was seen last summer carrying one off in his beak. They are perhaps their own worst enemies, for they are said to become cannibalistic if the food supply is not sufficient; and the female is believed to devour the male as soon as the mating season is over. In early October, the unpalatable remains of a victimized male may sometimes be found beneath a chrysanthemum plant.

The egg mass, containing up to 200 eggs, of which, apparently, many do not hatch here in the north, is deposited in the fall on any convenient rough surface that will hold it—frequently in a low crotch in the shrubbery. When the young mantids squirm out of their shells the following spring, they have the same form as the

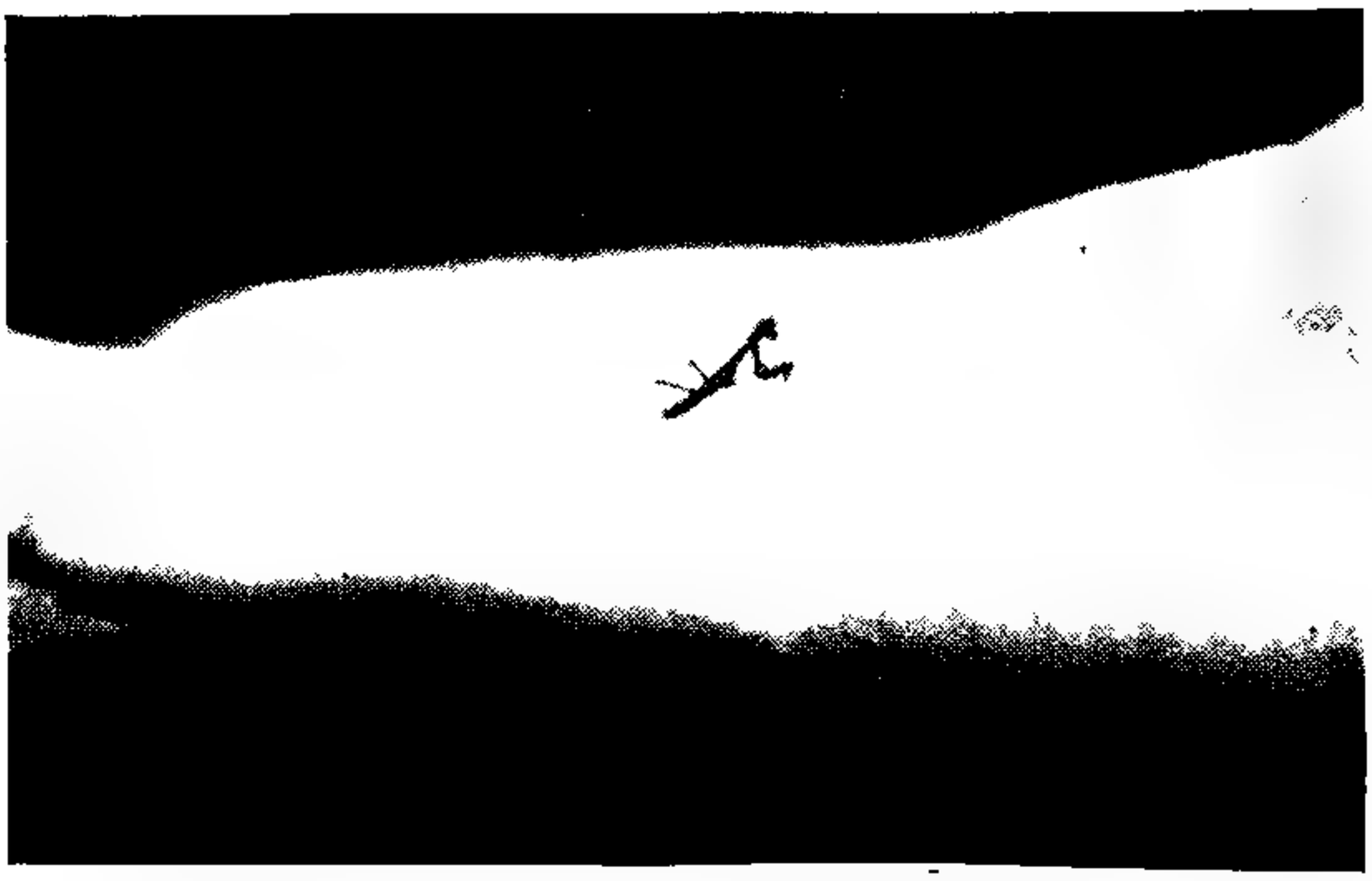


FIGURE 2. A newly hatched mantis, wingless and pale in color.

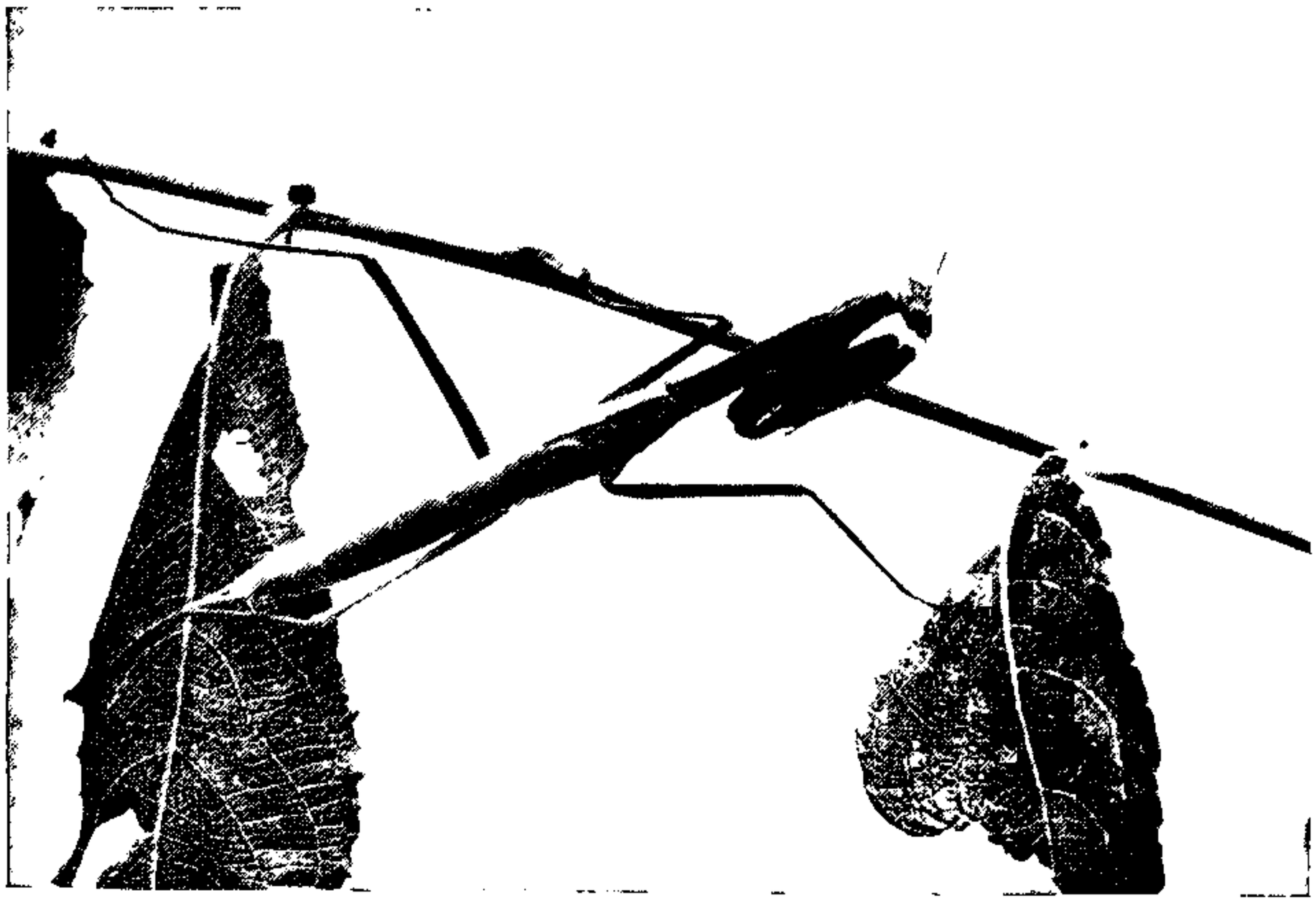


FIGURE 3. A nearly full-grown praying mantis, natural size, with "fore-arms" folded.

adult, except that they are wingless and at first are white or cream-colored. By August they are usually full grown. All through the season they feed on grasshoppers, crickets, butterflies, worms, beetles, leaf-hoppers, bees, lice—in short, on any flying or crawling insect or worm or bug that can be found on the plants which they inhabit.

As they approach their prey, they often wave their "arms" in front of it, as though to simulate a breeze, thus keeping their victim unaware of their proximity. When within reach, they snatch it as quick as lightning, then pose nonchalantly—albeit triumphantly—while they munch their food.

Their odd triangular faces wear an astoundingly human expression. They always seem to stare at a person as though at a fellow human being, with a most understanding gaze. And while one stares back, amused, with a scarcely perceptible motion the mantis has caught another insect for the next course of his meal. It is because of the many harmful pests that he destroys that he is a cherished friend of the gardener.

CAROL H. WOODWARD.

A LOAN COLLECTION OF LANTERN SLIDES

Eight sets of colored lantern slides, which are duplicates of The New York Botanical Garden's collections, have been selected from the material purchased from the Cornelius Van Brunt estate and are available for loan to members, garden clubs, teachers and other people needing lecture material on garden subjects.

There are particularly fine sets of slides of wild flowers, arranged in four groups:

Spring wild flowers are represented by a set of 98 colored lantern slides, constituting a representative assortment of the plants that bloom in the spring months from March to May. Fifty-four of these constitute a very satisfactory lecture series and 37 are supplementary slides which more or less duplicate the set.

Summer wild flowers are well represented by a comprehensive series of 148 slides. These include a great many of the native plants blooming in the months of June, July and August. They have not been arranged in separate sets but at least two or three very satisfactory lecture series could be selected from them.

Autumn wild flowers, comprising plants blooming from September until winter, are represented by only 43 slides—a rather short series, which include, however, most of the representative groups, such as asters and goldenrods.

The fourth set of wild flower pictures consists of 45 colored slides of Rocky Mountain flowers photographed at Banff and Lake Louise. Many of these are plants eminently suited to cultivation in rock gardens.

In addition to the wild flower pictures there is a miscellaneous collection of photographs of cultivated plants comprising 49 kinds of flowers shown in 91 different slides. This is quite a diverse lot from which material may be selected for a variety of subjects. There is also a good set of 48 colored slides of lilies of 20 different kinds, all of which are varieties well adapted to outdoor cultivation.

The eighth set is of cultivated orchids, of which there are 13 slides.

In addition to this garden material there is a very extensive set of slides showing the scenery of the Canadian Rockies around Banff and Lake Louise. The series consists of 184 slides, all admirably colored, evidently representing an extended trip by the Van Brunts through this region of remarkable mountain scenery.

There are also a few slides showing scenery in the Catskills at Beaver Kill and Balsam Lake, and a few local ones of the Bronx River and Bronx Park.

Any of these slides are available for loan to members of the Garden and supporting organizations for periods not to exceed one week's duration, providing the borrower agrees to come for them personally and return them either personally or by messenger. These loan slides are supplementary to the Stokes Wild Flower collection, which has been available on similar terms for a number of years. Individual members wishing to borrow these slides may either secure them by sets or select individual slides to meet their particular needs.

To non-members a service charge of $2 is made for each set.

FORMAN T. MCLEAN.

GARDEN-CLUB MEMBERSHIP IN THE BOTANICAL GARDEN

Garden clubs now constitute a new type of membership which is available in The New York Botanical Garden, according to the terms of a resolution passed at the annual meeting January 14. The annual membership fee for a club—twenty-five dollars—entitles the organization to certain privileges granted otherwise only to individual members of the Garden. Also, the club is given each year a special lecture on a selected subject by any member of the staff whom it may choose.

In addition to the satisfaction of contributing to the progress of horticulture, as exemplified by the extensive garden and laboratory work of the institution, the clubs which become members of The New York Botanical Garden are granted the following privileges:

1. One copy of the regular membership periodicals, such as the JOURNAL of the Botanical Garden, and all notices of special flower displays and other events of interest.
2. A pro rata distribution of excess plants as available from time to time to members. Thus last year there were distributed several thousand begonias, daylilies, and named varieties of chrysanthemums to members.
3. Participation in the courses of study for which there is a fee up to the amount of annual dues.
4. The privilege of one selected lecture by a member of the Garden staff, before the club, without any lecture fee, the only expense being the actual traveling expenses of the speaker.
5. Designation of three representatives to attend any extension courses that may be given, free of charge.
6. The privilege of consultations.

SPRING PILGRIMAGE TO HOLLAND FLOWER SHOW

A pilgrimage to the "Land of Tulips," sponsored by the Horticultural Society of New York, with the coöperation of The New York Botanical Garden and various other horticultural institutions, is announced. The special occasion is the Decennial International Flower Show to be held at Heemstede, Holland, in the spring of 1935. The visiting party from the United States will leave New York on April 30 on the S. S. *Statendam,* of the Holland-America Line. The main party will leave Rotterdam on May 18 for the return voyage, after ten days in Europe; or longer stays may be arranged, some permitting a visit to the Chelsea Flower Show in England. The indicated cost, including minimum first-class round-trip fare, is $484; a special rate in tourist class is $301. Further information may be obtained from John T. Scheepers, 522 Fifth Avenue, New York.

ACTIVITIES OF STAFF MEMBERS AT PITTSBURGH MEETING OF A. A. A. S.

At the meeting of the Botanical Society of America held in Pittsburgh, December 27–29, 1934, Dr. E. D. Merrill gave his address as retiring President under the title "Mental Excursions." This was one year in advance of the expected date, owing to the illness of the actual retiring President, Professor E. J. Kraus, of the University of Chicago.

Dr. Merrill was elected representative of the Society in the Division of Agriculture and Biology of the National Research Council for a three-year term, beginning July 1, 1935.

At a session of the Botanical Society of America with Section G of the AmericanAssociation for the Advancement of Science and associated societies, held on December 28, Dr. B. O. Dodge presided. He was elected President, also, of the Mycological Society of America.

In a symposium on "The Status of Systematic Botany in American Colleges and Universities," on December 27, Dr. H. A. Gleason presented a paper on "The Neglect of Some Important Families in the Teaching of Systematic Botany." Dr. Fred J. Seaver was reëlected Managing Editor and Editor-in-Chief of *Mycologia* and

was selected as the official representative of the Mycological Society of America at the Sixth International Botanical Congress to be held in Amsterdam, September 2–7, 1935.

Dr. S. M. Pady, Fellow of the National Research Council, who is carrying on a second year of studies at The New York Botanical Garden, presented two papers, one before the Mycological Society on "Intracellular Mycelium of *Gymnoconia interstitialis*" and another at a joint session with the American Phytopathological Society on "A New Type of Aeciospore Infection." Other members of the staff and students of the Botanical Garden who attended the meetings were Dr. and Mrs. Harold N. Moldenke and Miss Carol H. Woodward.

THE BOTANICAL REVIEW

A new monthly magazine, *The Botanical Review*, made its appearance in January of this year and already has attracted a subscription list of several hundred. It presents the unique feature among scientific journals in botany of containing no original research reports but articles upon particular topics, written by experts and prepared only upon invitation at the suggestion of one of eleven advisory editors. The purpose of the journal is to provide busy research workers, teachers, and students with an authentic and convenient means of maintaining general knowledge in all fields of botany. The need for such a journal has long been felt by many botanists, particularly in view of the great amount of research being published which for years has rendered contact with fields of work other than one's own specialty progressively more and more difficult.

The Botanical Review is the private enterprise of two botanists, Dr. H. A. Gleason and Dr. E. H. Fulling, and while the editorial work is conducted at The New York Botanical Garden, the journal has no official connection with the institution.

A GLANCE AT CURRENT LITERATURE[1]

The serial reprinting of volume one of Britton & Rose's "The Cactaceae" is completed in the December number of the *Cactus and Succulent Journal.* The publishers have arranged to bind the volume for subscribers who have saved each of the last 41 issues, in which this important work, long out of print, has gradually reappeared. A few pages at a time have been inserted in the center of each magazine since August, 1931.

* * * *

Paul Carpenter Standley continues his descriptions of the Rubiales in part 4 of volume 3 of *North American Flora,* issued December 21.

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The seldom seen flowers of a common variety of *Aspidistra* are shown, among other interesting plants, in the October number of *Addisonia.*

* * * *

American palmettoes, with photographs, drawings, and detailed descriptions, are the subject of fascicle 6 of volume 3 of L. H. Bailey's *Gentes Herbarum*—"occasional papers on the kinds of plants."

* * * *

The original forest types of southern New England, as revealed by fossil trees and plants, laminated clay records, fossil pollen from bogs, and the records of early travelers and surveyors, local history, and contemporary writings, is one of three articles in number 1, volume 5, of *Ecological Monographs,* published by the Duke University Press, Durham, N. C. Stanley W. Bromley is the author.

* * * *

The published works of Elizabeth Gertrude Britton are listed by Dr. John Hendley Barnhart in the *Bulletin of the Torrey Botanical Club* for January.

* * * *

Fruits of woody plants are the subject of a well-illustrated rural-school leaflet published by Cornell University in November.

[1] All publications mentioned here—and many others—may be found in the library of The New York Botanical Garden, in the Museum Building.

Diseases of plants—especially crop-plants—recorded in the United States during 1933, with a note on the distribution and destructiveness of each, occupy the large supplement to the January 15 issue of *The Plant Disease Reporter.*

* * * *

Ninety-five species of plants which were blooming outdoors at Kew on Christmas day should be ample evidence of the fact—too seldom recognized—that conditions for gardening in England are far different from those in America. The list given in *The Gardeners' Chronicle* for January 25 mentions, among others, several species each of *Rhododendron, Rosa, Erica, Viburnum, Daphne, Arbutus, Jasminum, Chimonanthus, Camellia, Veronica,* and *Armeria.*

* * * *

Fertilizing materials to be used on peonies are analyzed as to their composition and effect by L. E. Longley, of the University of Minnesota, in the *American Peony Society Bulletin* for last September and December. In the same issue, A. M. Brand gives concise, comprehensive directions for peony culture.

* * * *

The first of a series of practical articles by M. G. Kains on the care of trees appears in the January number of the *Gardeners' Chronicle of America.* Anthony Sailer gives helpful pointers on the arrangement of flowers for table decoration; Elsie M. Frye writes on dwarf conifers for the rock garden; and Vernon A. Young explains plant physiology in relation to the culture of the wild flower garden, warning that abundant and early bloom on plants brought in from the wild may indicate lack of adaptation.

* * * *

The *Journal of Heredity* for November reviews the work of the United States Department of Agriculture over the past twelve years in breeding strawberries, and describes seven choice varieties which have been selected from 170,000 seedlings, tested, and introduced to the American market because of their superiority, both for fresh fruit and for preserving.

* * * *

Effects of last summer's extreme heat and drought in the Middle West on trees and shrubs growing at the Missouri Botanical Garden are reported in the November *Bulletin* of that institution.

Some surprising instances of decorative plants from desert regions being used for food are cited by Hortense E. Weimer in the November *Cactus and Succulent Journal* in an article on the edibility of succulents.

* * * *

Mrs. Ethel Anson S. Peckham writes on the history and legends surrounding the iris in an entertaining article entitled "Servant of the Rainbow," which appears in the October *Bulletin of the American Iris Society.*

* * * *

Gerberas which, with protection, have been wintered successfully outdoors at the Boyce Thompson Institute for Plant Research are described in the October 20 issue of the *Florists' Exchange.*

A valuable report on the compatibility of spray and dust combinations which are used in control of insect pests and diseases of plants appears in the November 10 number of that magazine. Harry F. Dietz is the author of the article, which is a reprint from the October number of *Nursery.*

* * * *

Practical questions and answers on the growing of holly, compiled by Earle Dilatush, may be found in the *Florists' Exchange* of December 15.

* * * *

Winter hardiness of trees and shrubs at the Arnold Arboretum is discussed in a series of articles which are concluded in the December 11 issue of the institution's *Bulletin of Popular Information.*

* * * *

Shrubs which are on the borderline between tenderness and hardiness are the subject of a series of articles by W. J. Bean which began in the October issue of *New Flora and Silva.* In the same number, Dr. Fred Stoker writes on alpines under glass and G. A. Phillips on hardy plants for hot dry soils. In addition, there are descriptions of many new and interesting plants, notably from the Pacific coast of North America.

* * * *

A profusely and beautifully illustrated article on the Royal Botanic Gardens at Edinburgh is a feature of the October *Na-*

tional Horticultural Magazine. Helen M. Fox writes about her experiences with a large number of annuals in the same issue.

* * * *

"Medicinal Plants of Mexico" is the title of a new book in Spanish by Maximino Martinez, which was recently acquired by the library. Botanical descriptions and illustrations, and popular descriptions and uses of a vast number of plants are recorded. A thorough index simplifies reference to the work.

* * * *

Of distinctly practical as well as scientific value is the report of G. E. Nichols on his experiments with the germination of seeds in the October number of *Ecology.* "Influence of Exposure to Winter Temperature on Seed Germination in Various Native American Plants" is the title of his paper.

A geological explanation of the origin and present distribution of the New Jersey Pine Barren vegetation is given by H. J. Lutz, also in the October issue.

* * * *

New annuals that have been tested during 1934 are described in the November 15 issue of *Horticulture* under the title, "Novelties for Next Year's Gardens."

* * * *

Seven steps in growing a perfect pot of daffodils are illustrated by Lina Longaker Kranz in the *American Home* for November. Window gardening as an indoor winter sport is the subject of James H. Draper, Jr., while Ethelyn E. Keays and Vesta P. Crawford each write on roses and Frederick Boissevain treats of gentians.

* * * *

How species of *Abies* under cultivation in the United States can be identified by their leaf structure is the subject of Edmund H. Fulling of The New York Botanical Garden in the *Bulletin of the Torrey Botanical Club* for December. While the author does not propose substituting such means of identification for the accustomed method, he offers it as a supplementary means, describing in both paragraph and tabular form the leaf-structure typical of each fir, and showing in reproductions of photomicrographs cross-sections of nearly fifty species.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

"Flora of Bermuda," the 585-page, illustrated volume by Nathaniel Lord Britton and others, the rights of which Dr. Britton left to The New York Botanical Garden, has been placed on sale in the Museum Building, at the reduced price of $3.50. The book, which was published by Scribner's in 1918, contains special sections on Mosses by Elizabeth G. Britton, Hepatics by Alexander W. Evans, Lichens by Lincoln W. Riddle, Fungi by William A. Murrill and Fred J. Seaver, and Algae by Marshall A. Howe.

The Botanical Garden has also this month reduced the price of "A Text-book of General Lichenology" by Albert Schneider, published in 1897, to $2.50, and has added Britton's "Manual of the Flora of the Northern States and Canada" (second edition, 1907) to its list of books on sale, offering the latter at the accustomed price of $2.50.

Director E. D. Merrill has been appointed one of the two presidents of the Taxonomy and Nomenclature Section of the Sixth International Botanical Congress to be held in Amsterdam, September 2–7, 1935. Dr. Merrill was the sole chairman of this section at the Fifth International Botanical Congress that was held in Cambridge, England, in August, 1930.

Dr. Merrill has been elected non-resident vice-president of the Washington Academy of Sciences for 1935.

Dr. and Mrs. Philip H. Gregory visited the laboratories of The New York Botanical Garden January 4, while in New York on their way to England. Dr. Gregory, who has spent the past year at Manitoba Medical College in Winnipeg, investigating fungi that cause human diseases, is to be plant pathologist at Seale Hayne Agricultural College, Newton Abbot, Devon, England.

The January issue of *The Girl Scout Leader* contains an article, "Where Our Food Plants Come From," by Dr. E. D. Merrill, illustrated with a picture of the exhibit of the origins of food plants, staged by The New York Botanical Garden at the Fall Flower Show in New York.

PUBLICATIONS OF

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

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SPRING LECTURES AT THE GARDEN

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SOUTH AFRICA—A LAND OF MANY FLOWERS

South Africa and the Rhodesias are such unknown country to most Americans that the returning traveler is treated rather as one miraculously delivered from the maw of hungry lions. To mingle with the passing throng in the streets of Cape Town or Pretoria, Johannesburg or Durban, or even to travel through the wildest parts of the country, is a pleasant experience but hardly a dangerous one. The so-called "Dark Continent" is anything but dark, having many more hours of sunlight than we have. The South Africans, Dutch or Dominion English, are agreeable, hospitable people whom it is a pleasure to know, and their civilization is as settled as ours.

There are, of course, many wild sections, far from railroads, where natives are natives and primitive conditions prevail. In such places a woman may walk alone and unprotected far from contact with white people, utterly safe because the natives are to be feared only where they have come under evil influences which so often follow civilization. The untouched native, though he may not know enough to answer a greeting, is friendly. He may stop his work and follow the passer-by with his eyes so long as she is in sight, but he will not harm her. He may even warn her with the one word "Momba!" that the damp and delightful meadow with rocks and grassy tufts is the haunt of South Africa's most deadly snake, fortunately rare and not aggressive unless molested. One need not walk in that special spot, but Momba or no Momba, a botanist will be very happy, for flowers grow freely on the open veld or in the thin shade of the trees, and a little pink gladiolus, for instance, growing in half shadow among tall grass, may prove to be a new species. There is surely a thrill in that!

Here is a tall flower like a pinkish-mauve foxglove; this one is a legume with its sweet-pea-like flowers of greenish-yellow and mauve. Near it is its cousin, another legume, the flowers purple, touched with a lighter shade: Ceratotheca and Dolichos and Physostigma perhaps. This is the Low Veld up in the interior with an altitude of about 3,000 to 3,500 feet. The soil is rather sandy and the pea-flowers predominate, though there are many others also.

We come on a gorgeous crimson Crinum with 20 to 30 lily-like flowers 7 to 8 inches long. There are bare rocky hills scraped smooth, one would think, by glaciers, yet there has been no ice-age here. A few low succulents or stunted shrubs cling to these rocks. Euphorbias grow into trees in this land and a little nearer the equator the obese-looking baobab tree (*Adansonia digitata*) is seen occasionally, an unattractive object, though it is said to be beautiful when covered with its large creamy-yellow flowers. There are many miles of bare, almost desert land, then a tree-growth, but rarely anything that would suggest our idea of a jungle.

Hundreds of miles of High Veld (about 6,000 feet altitude) and Low are open grasslands with few trees, bare but quite beautiful with great folds of mountain and valley showing many lights and shadows. It is especially lovely at sunset. Many flowers grow here after the rains, which come in summer in this northern part of the country. The great plateau covers much of the interior in the Transvaal and the Orange Free State, stretching north into Southern and Northern Rhodesia.

As we go to the east and follow a river valley down to the Indian Ocean at Durban, the vegetation grows richer and more tropical. A warm ocean current and warm winds which blow down the valleys encourage the growth here of beautiful flowers after the summer rains, and among them are many bulbous plants which may be transferred to our gardens. The road down to the sea winds in and out through mountains with grassy meadows and rocky passes. On the slopes grow flowering shrubs, herbs and bulbs and succulents. Here in this coast belt are Gloriosa and Cyrtanthus, Brunsvigia and Clivia, Gladiolus and many others. In the Drakensberg Mountains to the south, we shall find tree-ferns, besides a great variety of flowers.

Down in the southern and southwestern part of the Cape Prov-

FIGURE 1. The obese-looking baobab tree is a striking feature of the landscape in the warmer sections of South Africa. When in bloom it is covered with large creamy-yellow flowers.

ince is an abundant growth, though the abundance is rather that of California than of our eastern all-seasonal rain districts. The southern province has heavy winter rains and a long, nearly dry summer. The flowers come with a rush in the spring-time, which begins in September, the seasons being opposite from ours. Bulbs and annuals and succulents burst into bloom everywhere; daisies of blue, pink, scarlet, orange, crimson cover the country—Ursinia,

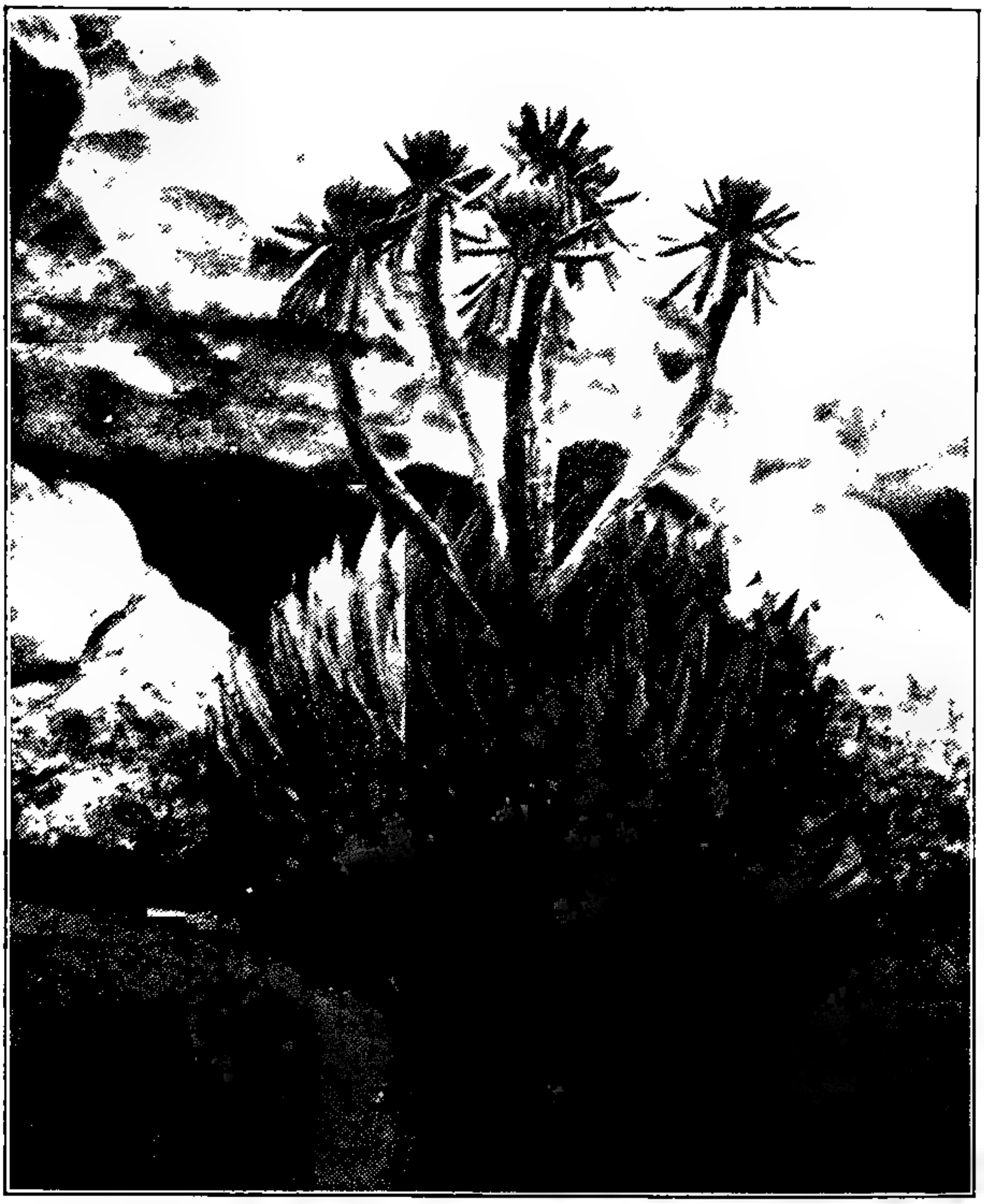

FIGURE 2. *Aloe polyphylla,* a choice succulent of Basutoland, South Africa, growing among the rocks in the National Botanic Garden, Kirstenbosch, near Cape Town.

Arctotis, Charieis, Felicia, Dimorphotheca, and others; here are many Pelargoniums and Ericas; Ornithogalums, the "chinker-inchees" of lasting qualities in white and orange; the odd Proteas and the Leucospermums with their heads of bright color; the intensely blue Heliophila, in shape like our wild mustard. On the slopes of Table Mountain, the air in early spring is heavy with the perfume of the sweet-pea bush, *Podalyria calyptrata,* the blossoms

in pink masses. Lovely little Moreas in white and blue and yellow, like tiny Irises, are blooming on the sand flats and small Gladiolus in pale mauves and pinks and blues, henna red and crimson are seen here and there. Quaint orchids, Satyrium and Disperis and Pterygodium are common, some exactly like a little hood with cap strings, the "moederkappjes," mother's hoods. Crossing a mountain pass, the hillsides are gorgeous with clumps of a tall blue Aristea and an equally tall pink Watsonia, cousins of the Gladiolus, both of them.

On the grassy plain down toward the Cape of Good Hope we find, within a few minutes, small relatives of the Barberton daisies, a brilliant crimson-scarlet Erica, a blue Lobelia, a tiny yellow orchid, *Disa patens,* with wide-spread petals, a tall bulbous plant with yellow flowers, *Bobartia spathacea,* the fibrous leaves of which are made into twine. Bushy Pelargoniums grow on the peninsula. In swampy spots here is the coral *Watsonia Comptonii*; on a mountain-top is the blue *Watsonia punctata*; and as blue are the low-growing Aristeas, small Irids, *A. cyanea* and *A. juncifolia,* and the "cups of wine," *Geissorhiza rochensis,* the lower part of the petals crimson, the upper blue, the shape of the flowers suggesting a half filled wine-cup. We find the interesting though "sad-colored" *Pelargonium triste,* with dark-brownish or dull-crimson and greenish flowers, and for a constant accompaniment, masses of white callas, which have as relatives the yellow and the exquisite little pink one, *Zantedeschia Rehmanni.* There is hardly a spot where in a space of a few hundred feet one cannot find at least a dozen flowers new to the visitor. It is not surprising that South Africa seems a botanist's paradise.

SARAH V. COOMBS.

SOUTH AFRICAN WILD FLOWERS

The southernmost point of the "dark continent" has been one of the richest sources of ornamentals since the time of its discovery by the Portuguese and Dutch. As in all semi-arid countries, the flowers of South Africa run to exceedingly brilliant colors and the gardeners of the Old World of the last century vied with each

other in growing collections of South African heaths, geraniums, and flowering bulbs, just as our modern gardeners compete for the handsomest chrysanthemums, dahlias, and orchids, and for the most extensive collections or alpine rock garden plants. Few of these early introductions proved really adaptable in the northern hemisphere as outdoor subjects and in our northern gardens almost the only representatives nowadays from South Africa are Gladiolus and some of the newly introduced South African annuals.

The reasons for the rich and varied vegetation of South Africa are to be found in its location at the temperate semi-arid end of the great tropical continent, with its varied topography from seashore to mountain and desert, and in its climate, which ranges from the frequent rains of the subtropical coast in Natal to extreme dryness in the west and temperate Thornbush country with winter rains in the southwest. Moreover, the geology of South Africa has not been marred by upheaval or rapid change. This region has experienced no ice age, and the land area has remained much as it appears today, except that it has grown gradually drier and drier, since earliest geological times.

Entering the country at its principal seaport of Cape Town, one is immediately impressed with the scrubby and thorny growth that characterizes the coast. The only trees are the silver-trees (*Leucadendron argenteum*) and the imported pines and oaks from California and from England.

From August to October the hillsides are ablaze with a varied and colorful assortment of flowers. Among the earliest blooms are those of the oxalis, which come in shades of pink, red, yellow, and white. *Oxalis Bowei* is one of the handsomest in the genus. At the height of the flowering season every little thorny shrub or wee shoot from a fleshy bulb is topped with a mass of blossoms. Then one literally finds everything in bloom, and it is no remarkable feat to collect 150 or 200 different kinds of flowers in a single afternoon. These will include such familiar things as everlastings, African daisies, the blue Felicia, and a number of different species of Pelargonium, relatives of the garden "geranium," of which there are 250 species found in Cape Province alone. Mesembryanthemums make great patches of glistening blossoms of wine-color, scarlet, yellow, white, and pink. In wet spots callas lift their white cups above the dense shrub thicket, and here and on the higher hill-

FIGURE 1. *Gladiolus primulinus* is a South African subject, coming from the swampy vleis and being successfully introduced into American and European gardens.

sides is a bewildering variety of flowering bulbs, including Ixia, Watsonia, Moraea, Gladiolus, Ornithogalum, Nerine, and scores of less familiar members of the Lily, Iris, and Amaryllis families. From *Gladiolus tristis* in the swamp and *G. carmineus* on the rocks of the seashore to *G. maculatus* and *G. cardinalis* on the mountains, Gladiolus species show particularly great adaptability, and they bloom during every month of the year. In the shrubby thickets one finds ornamental asparagus of the so-called "asparagus fern" types, shrubby lobelias and salvias and some of the odd little native orchids. Higher in the hills the South African heathers are found in nearly 500 different kinds, and the rare Disas with their brilliant hooded flowers hold up the reputation of their tropical orchid cousins for beauty and oddity.

Traveling north and east from Cape Town, one leaves this southwest province with its winter rains and summer drought and in the interior first encounters a region of scanty rainfall and unique succulent growth. This is the South African Karroo, where the rich soil and dry hot climate have developed a remarkable vegetation duplicated nowhere else in the world. Here the growth is primarily of fleshy succulent plants, including Crassulas, Cotyledons, Stapelias, Mesembryanthemums, and Euphorbias. Even the Daisy, Geranium, and Lily families share in this succulent habit of growth. There are numbers of cactus-like Senecios and Kleinias, and forty succulent species of Pelargonium, some of them almost leafless, as well as scores of different Aloes, with their thorny leaves and fleshy blades, which share the scanty gravelly soil with Haworthias, Gasterias, and other leafy succulents. On the rockiest hillsides little Mesembryanthemum relatives, the Conophytums, have their entire plant-bodies buried in the soil with simply a rough stony-looking surface exposed, its translucent surface tissues letting the light into the green subterranean tissues.

The prevailing colors in this perennial vegetation are browns and grays. The only real show of green comes in the rainy season, when the bulbous plants and the ephemeral annuals enjoy their short growing period. Then Babiana, Lapeyrousia, Hesperantha, Moraea, Haemanthus, and numbers of fine Ornithogalums make the forbidding countryside bright with flowers. The only trees and large shrubs are along the river ravines, but the rocky hills have a more luxuriant vegetation than have the flat plains. The Karroo country is nearly all plateau with an elevation of about 4,000 feet.

North and west of the Karroo country the climate gets still drier and changes into the western desert, which extends right down into the Atlantic in the section known as Namib. Here plant life is really sparse, consisting of only a few species, most of them confined to the sandy river beds. Species of Euphorbia and Mesembryanthemum grow in the more favored situations. Watermelons and other cucurbits spring up and grow during the infrequent rainy periods and there are many desert annuals with short growing sea-

FIGURE 2. The bright flowers of Conophytum are typical of the remarkable succulent growth in the South African Karroo.

sons and lavish though brief flowering periods. These include Nemesias and annual Mesembryanthemums, and Indigoferas not yet known in cultivation. On the sandy plains the curious *Welwitschia mirabilis* ekes out a poor existence, retaining its two immense woody leaves throughout its long life. In this arid climate the adaptation of African plants to dry conditions is carried to its greatest extreme.

Going eastward and southward past the Karroo country to its borders, one comes first to grassy plains known as Grass Veld. This is predominantly grazing land. Among the grasses, as in our

own western plains, there are many low-growing flowers—Gazania, Gerbera, Anthericum, Chlorophytum, Helichrysum, Alyssum, Senecio. Among these there are also large numbers of flowering bulbs—Ornithogalum, Cyrtanthus, Hypoxis, Moraea, Gladiolus, and Scilla. The *Gladiolus primulinus* of our gardens comes from the swampy vleis, while the showy *G. psittacinus* and *G. quartinianus* grow in better drained areas.

Next to the Thornbush country the Grass Veld has probably yielded us our finest South African ornamentals. Along the eastern and southern borders of the Grass Veld, in the Low Veld, one encounters more and more growth of trees and this so-called Tree Veld imperceptibly grades into the subtropical woodland and grassland area of the east coast. Both the Grass Veld and the coastal woodland are cut through by deep river valleys in which the vegetation is rendered sparse and ungracious by the hot winds which sweep them from the high interior. Accordingly the growth along the river valleys is made up of drought-resistant shrubs and succulents similar to those of the high interior.

FIGURE 3. The types of South African daisies are innumerable, and many of them make attractive plantings in annual gardens in the northern hemisphere. The blue and white flowers shown here, *Dimorphotheca pluvialis ringens*, natives of the Grass Veld, were displayed in Conservatory Range No. 1 at The New York Botanical Garden in March, 1933.

The subtropical coastal region has in it many of the plants familiar to us in the cool greenhouse—Agapanthus, Scilla, Crinum, Clivia, Streptocarpus, Thunbergia, and even a few Begonias grow in the partially shaded woodlands. As this is a region of abundant summer rains after relatively dry winters, a number of the plants have perennial underground bulbs. These include not only the normally bulbous members of the Lily and Iris families, such as Gladiolus, Ixia, etc., but also certain of the Begonias, such as *Begonia Sandcriana*. It is the species of Gladiolus from this region of summer rains—*Gladiolus psittacinus, G. oppositiflorus, G. purpureo-auratus, G. papilio,* etc.—that have given rise to the cultivated garden hybrids. The much richer assortment of bulbous plants of the neighborhood of Cape Town are winter growers, requiring cool greenhouse culture, and few of them adapt themselves to outdoor culture in the United States outside of California, which has a similar climate.

The interest in African material has been lately reawakened, and new flowers from the far-away tip of this continent are being adopted by an increasing number of American gardeners. Among the recent introductions of annuals suitable for outdoor culture, which have been exhibited during the past two winters in the conservatory at The New York Botanical Garden, are species of Dimorphotheca, Ursinia, Heliophila, Nemesia, and Felicia. This year The New York Botanical Garden is planning an exhibit of South African flowers at the International Flower Show. Mrs. Sarah V. Coombs, who has recently returned from an extensive trip in South Africa, has brought back for the Garden a fine assortment, particularly of the unusual bulbs and of the succulent plants of Karroo, which will form an important part of the exhibit.

FORMAN T. MCLEAN.

THE CULTURE OF THE SMALLER CAPE BULBS

The flora of South Africa is rich in showy species which make a special appeal to the gardener. Of these, the plants grouped together under the common designation of "Cape bulbs" are particularly interesting and are really worthy of wider attention than they

at present receive. Their culture presents few difficulties once the details are understood, but any neglect of these special requirements can only result in disappointment.

Bulbs (the term is used in a broad sense to include corms) of such kinds as *Gladiolus tristis, Tritonia crocata, Ornithogalum thyrsoides, O. aureum,* and *Lachenalia tricolor* are offered by dealers, but many other desirable species are unobtainable in this country. Fortunately, seed offers a ready means of securing stocks providing the gardener is endowed with a reasonable amount of patience. The seed may be sown in well-drained pans of light soil at any time of the year, but experience at the Botanical Garden has shown that the month of August is to be preferred and that seeds sown earlier remain dormant for a period and germinate at the same time as the August-planted seed. Certain kinds give satisfactory results only if they are subjected to a chilling by being plunged in a frame out of doors during September. The seedlings, if exposed to full sunlight and cool and airy growing conditions, make rapid progress, and some will produce flowers during the spring following sowing, but the best results are not obtained until the second season.

Mature bulbs are planted in late August in a rich but light soil. They may be placed close together, so that a six-inch pan will usually accommodate eight or ten individuals. After planting is completed, the pans are watered and placed in a frame with a covering of sphagnum moss to conserve moisture and reduce the need for frequent applications from the watering-pot until root-growth is developed. When the bulbs are well established and before severe weather occurs, they are brought indoors into a sunny, well-ventilated greenhouse having a night temperature of 50 to 55 degrees, rising with sun heat in the daytime to 60 or 65 degrees. Watering must receive careful attention during the dull days of winter and on all favorable occasions the foliage should be lightly sprayed with clear water to prevent the occurrence of red spider. Twiggy brushwood cut direct from the woods provides the best support and this is placed in position early so that the stems grow up through the branches. When the flower buds show, weekly applications of dilute manure-water are in order, but these should be discontinued when the flowers expand.

The period immediately following flowering and until the dormant stage is reached is of great importance in the cultural cycle.

During this time every effort is made to build up good flowering-sized bulbs for the following season and with this end in view feeding at frequent intervals with dilute fertilizers is necessary. The completion of the growing season is indicated by the maturing of the foliage. When this stage is reached feeding should cease and the moisture supply be gradually reduced, until the leaves have died down completely. Then water is withheld altogether and the soil in which the bulbs have grown is kept quite dry until the season for repotting arrives again. It is important that this drying-off process be done very gradually, as a sudden cessation of watering will seriously interfere with the quality of flowers produced the following season.

Important genera of Cape bulbs include, in addition to those already mentioned, Sparaxis, Ixia, Watsonia, Albuca, Antholyza, Freesia, Oxalis, Cyrtanthus, Vallota, Nerine, Babiana, Tulbaghia, Bulbine, Anoiganthus, Homeria, and Streptanthera.

The cultivation of South African annuals will be treated in a forthcoming number of the JOURNAL.

T. H. EVERETT.

THE LEMON DAYLILY (*HEMEROCALLIS FLAVA* L.): ITS ORIGIN AND STATUS

When, where, and how the familiar Lemon Daylily (*Hemerocallis flava*) came into culture are matters of horticultural interest. What its nearest wild relatives are and where they now grow are especially matters of botanical interest. It is the purpose of this article to summarize and to evaluate the evidence on these questions, with special reference to the origin and development of this plant.

The Lemon Daylily is one of the oldest of plants cultivated in flower gardens, for it was already in cultivation in Europe when the first books were written about such plants. It was fairly well described in a volume (Pena and Lobel, Stirpium Adversaria Nova, 1570) under the name *Asphodelus luteus liliflorus*. It is stated that it was then familiar as a cultivated plant in gardens in France and Holland but not in Italy, that it was listed by the "Pharmacopoei Veneti," and that its medicinal product had been seen in shops, especially in Antwerp.

Six years later (in Historia, by Lobel, 1576), there was printed an excellent woodcut of this daylily showing an entire plant (see FIGURE 3). This is the first illustration known for any plant of the genus *Hemerocallis* as now recognized. It is certain that this plant was then being propagated vegetatively by division as a garden clone and that it has continued to be thus propagated until the present time. Hence, the plants of this particular type now growing in our gardens are merely pieces of the same individual illustrated more than three and one half centuries ago.

Some of the earlier writers recorded certain ideas regarding the natural home of this plant. Clusius in 1601 (Rariorum Plantarum Historia) states that he had found it growing wild in Austria. Linnaeus, who first called the plant *Hemerocallis Lilio-Asphodelus flavus* (Species Plantarum, 1753), states that its habitat was Hungary and Siberia. We should note that later he decided to name this plant *Hemerocallis flava* (Species Plantarum, second edition, 1762) and that this is the botanical name which has continued in use. Miller (Gardener's Dictionary, 1768) states that this daylily grew in Hungary, Dalmatia, and Istria. Numerous references since that date cite the plant as wild in certain parts of Europe and in Siberia.

A recent letter from Professor August Ginzberger, of Vienna, Austria, states that the colony of *Hemerocallis flava* observed by Clusius in the year 1580 is still in existence. The location is near Güssing in the area called Burgenland. Professor Ginzberger has kindly offered to go to the colony and obtain living plants for shipment to The New York Botanical Garden and plans have been perfected for him to do so.

We may first consider whether *Hemerocallis flava* L. and also the *H. fulva* clone Europa exist in the wild in Europe as indigenous plants or merely as early escapes from cultivation. A recent flora (Hegi und Dunzinger, Illustrierte Flora von Mittel-Europa, vol. 2, p. 205) reports that these daylilies grow wild or naturalized outside of gardens, but chiefly in the vicinity of cloisters and old castles, over a rather wide area of middle Europe. It is stated that the *H. flava* seeds freely but that the *H. fulva* never produces seed, although it is more widely distributed as an escape. The *H. fulva* of Linnaeus (the Europa Daylily) is merely a triploid clone which happens to be completely self-incompatible and also so nearly im-

FIGURE 2. Capsules of the Lemon Daylily, nearly natural size, obtained by controlled self-pollination. The large size and elliptic shape of the capsules are characteristics that distinguish this plant from all other yellow-flowered species now known.

potent from the sterility of triploidy that it rarely sets seed to any sort of cross-pollination. Its distribution has involved only the transfer of pieces of the living plant. This clone is botanically to be included with a type widely distributed in the Orient, both as wild and as cultivated plants. Since this Europa Daylily undoubtedly came to Europe from Asia it seems reasonable to assume that the Lemon Daylily also did. The evidence seems to indicate that both the Lemon Daylily and the Europa Daylily were already somewhat naturalized in Europe, at least in Austria, as early as 1580, at which time they were more widely cultivated as garden plants.

Various publications on the floras of Siberia, China, and Japan state that *H. flava* is an indigenous species and there are also numerous specimens labeled *Hemerocallis flava* L. in herbaria of collections made in these countries. From these data one would naturally conclude that this species is widely distributed in the Orient. For many years the writer concurred in this view, but after further critical study he now questions this evidence.

The best plant material for study of the identities of daylilies is of course living plants. During the past few years various shipments of living plants and of seeds labeled *Hemerocallis flava* have come to The New York Botanical Garden from rather widely separated districts of the Orient. Also seeds or plants of unnamed yellow-flowered daylilies have been received and grown. In no case has any plant thus obtained even closely resembled the type of *H. flava* L. which is still in general culture in Europe and America. Furthermore, a careful inspection of the descriptions of *H. flava* in floras of the Orient and of the herbarium specimens from this area does not reveal any type of *Hemerocallis* that can be definitely assigned to the *H. flava* of Linnaeus.

The type or clone of Lemon Daylily (FIGURE 1) most gen-

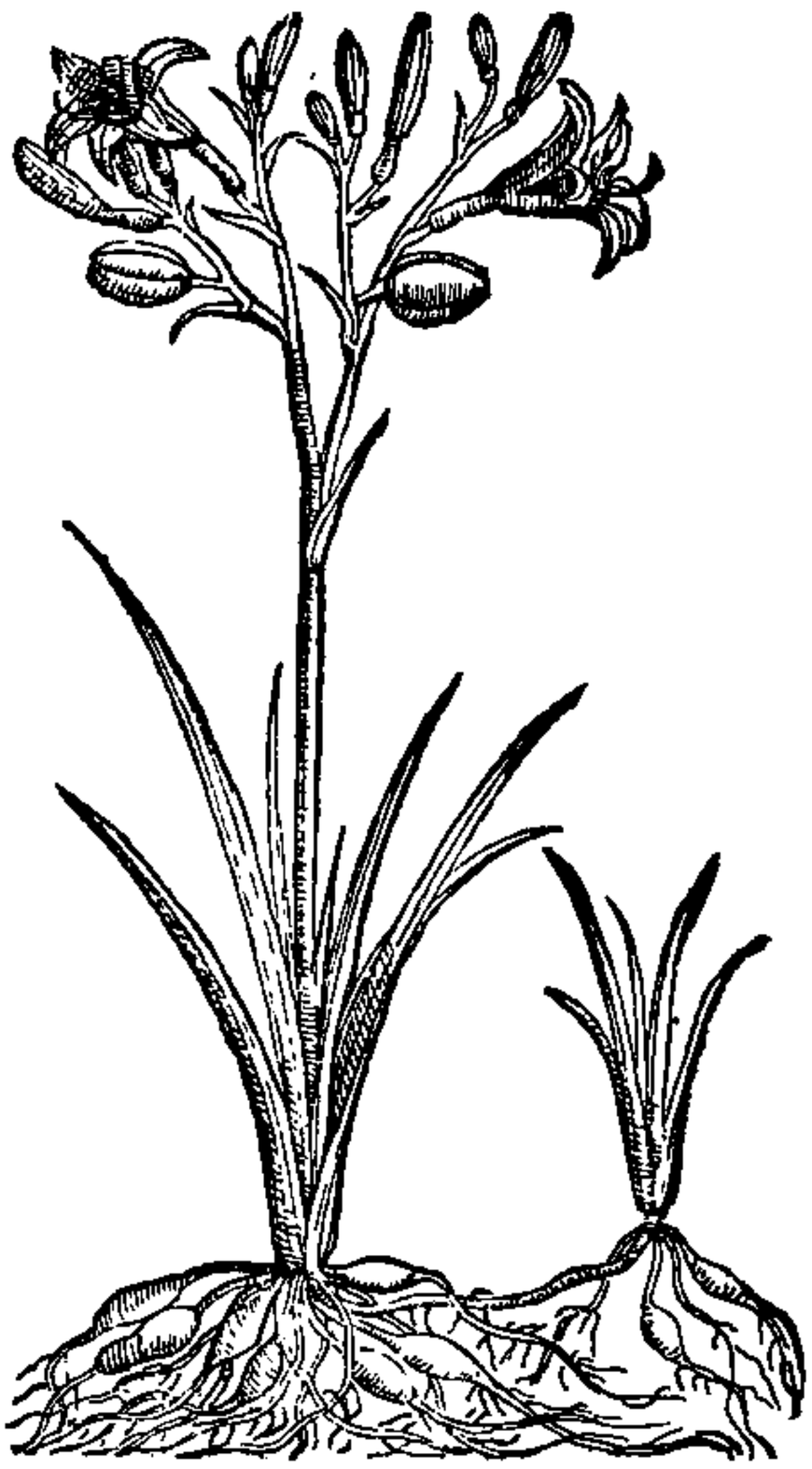

FIGURE 3. This illustration of the Lemon Daylily is from a photograph of a woodcut published in Lobel's Historia in 1576. In respect to the large size and the shape of the capsule, as well as in numerous other characters, the clone of the Lemon Daylily most commonly cultivated at the present time appears to be the same as the plant here illustrated.

erally cultivated in Europe and America is distinct and very different from all other types or species of daylilies now known. In the region about New York it flowers early in spring at the same time that *Hemerocallis Dumortierii* and *H. Middendorffii* do. Its flowers are medium-large, fairly full, clear lemon-yellow in color, agreeably odorous, widely open by day and they regularly remain open for at least 24 hours. The capsules (see FIGURE 2) are nearly triangular in cross-section, elliptic in shape, and much larger than those of any other of the older types of daylilies; and they conform to the capsules shown in the woodcut published in Lobel's Historia in 1576. The scapes are branched and about three feet tall. The stems of the crown spread rather widely underground to form rhizomes. The roots are noticeably enlarged and fleshy.

As a rule the yellow-flowered daylilies obtained from the Orient have bloomed later than the Lemon Daylily, the capsules are decidedly different in shape and size, and they all possess other obvious differences.

The type clone of the Lemon Daylily is highly self-fruitful and the plants readily produce large capsules and numerous seeds to controlled self-pollination or even to autonomous self- or close-pollinations which may be effected in the garden by large diurnal butterflies or large nocturnal moths. About forty seedlings have been grown at The New York Botanical Garden from seed of controlled self-pollinations of this plant. All these plants show the essential botanical characters of the parent, but there are decided variations in the size and the fullness of the flowers (see FIGURE 4) and in vigor and hardiness; and, although some have had larger flowers, none has surpassed the parent as a desirable garden plant. This may explain why the plant has been propagated in horticulture as a clonal variety rather than as a seed variety. It is readily and easily propagated by division, giving plants of the same individual characters, and this method has evidently been employed since this daylily was first cultivated. It is stated that the naturalized plants of *H. flava* now growing in middle Europe produce seeds, and presumably these may be a means of extending the distribution. If so, some variation in the plants may be expected. The variations which the writer has observed in the selfed progeny and in the F_1 progenies of hybridization involving the type clone of *H. flava* are, however, not sufficient to indicate that this plant is itself a hybrid.

FIGURE 4. Flowers of four seedlings grown from selfed seed of the Lemon Daylily. There is some variation in the size and the fullness of the flowers.

There are several somewhat different clones in garden culture which resemble the Lemon Daylily and seem to be related to it. One of these, which came to The New York Botanical Garden as *Hemerocallis minor*, has smaller flowers, very erect foliage, and beaked capsules. This clone is self-incompatible but readily crosses with the Lemon Daylily. Various of the plants received as *H. flava* from botanical gardens in Europe are somewhat different from the type clone. The name "*H. flava major*" is applied both to the type and to other daylilies. Some of the garden clones called *H. flava* and *H. flava major* are certainly hybrids; others may have arisen as seedlings of the original clone of *H. flava*.

In respect to the chromosome number, the Lemon Daylily has 22 (2 x 11), which is the normal diploid number for the genus. It is not unusual or noteworthy in its chromosomal complex, as is the triploid *H. fulva* clone Europa.

Eastern or central Asia is without doubt the native home of the daylilies and the center of their natural evolution, origin, and distribution. Certain of them are of ancient cultivation in the Orient for food, for medicinal uses, and as garden flowers. The Lemon

Daylily, together with the fulvous Europa Daylily, was probably taken from the Orient to Europe at an early date, primarily for the medicinal uses noted by Pena and Lobel in 1570. But the Lemon Daylily was and still is an excellent plant for flower gardens and in this use it has continued in culture to the present date.

Cultivated plants are often very different from the wild species from which they arose. When they are not hybrids or polyploids but selections or developments from a wild species they usually possess its essential specific characters but they may differ greatly in characters such as vigor, habits of growth, and size of flowers. Such variations are often important in horticulture, especially when they may be continued by clonal propagation.

The plant named *Hemerocallis flava* by Linnaeus in 1762 had then already been cultivated in Europe for at least 192 years, and it has continued to the present time by clonal propagation. In portions of middle Europe it has become somewhat naturalized and possibly this has involved reproduction by seeds. In America it persists in abandoned garden sites but does not spread readily and become naturalized as does the *H. fulva* clone Europa. There is no indication that the plant is itself a hybrid or a polyploid mutation. At the present time there is no reliable evidence that a wild species which has the essential botanical characters of this plant exists in the Orient. Possibly such a species does exist there but has not been discovered or at least accurately described. Until adequate descriptions are available for the types of wild and cultivated daylilies in the Orient, one can scarcely make a satisfactory conclusion regarding the origin of this old familiar garden plant, the Lemon Daylily.

A. B. Stout

GYPSY MOTH CONTROL IN NEW YORK STATE[1]

The discovery of an outbreak of the gypsy moth in the Bronx in June, 1934, involves the Borough, particularly its Park Departments, in one of the most serious tree-pest problems with which they have yet had to deal.

The occurrence of the outbreak is, of course, an unfortunate circumstance. We nevertheless find some consolation in the fact that the outbreak was discovered before it reached a degree of intensity where the possibility of extermination would be questionable or the undertaking impractical. As we view the situation today, there seems to be no doubt that if adequate financial support is provided for the intensive control program that must be continued for several years, the outbreak can be suppressed.

Of the 41 square miles in the Borough of the Bronx, 17 square miles, or 40 per cent, has been found to be generally infested. Colonies have been located in Van Cortlandt Park, Woodlawn Cemetery, New York Zoölogical Park, Pelham Bay Park, Pelham Parkway, and The New York Botanical Garden, in addition to the numerous colonies located on private property, which will be handled in the same manner as those on public land.

The control work consists of a systematic inspection of all forest trees, shade trees, fruit trees, shrubs, stones, dead wood, and débris for the gypsy moth egg-masses,[2] which are immediately

[1] This paper has been prepared especially for the JOURNAL, in the interest of preservation of our trees and shrubs through control of the gypsy moth, by H. L. McIntyre, Superintendent of Forest Pest Control, State Conservation Department, Albany, N. Y.

[2] From August until May the tan-colored woolly masses of the eggs of gypsy moths may be seen on bark of trees, stones, fences, and débris. In April and May the tiny caterpillars hatch from the eggs and feed upon leaves of apple, oak, birch, maple, elms, and other deciduous trees. By July they are full-grown and seek a sheltered spot in which to pupate. In a week to ten days the moths emerge, the male to fly abroad, the female to lay her woolly mass of eggs nearby, then die.

Insects suspected of being gypsy moths will be identified at once if sent to the State Conservation Department at Albany. The New York Botanical Garden is ready to coöperate by identifying insects brought or sent to its laboratories. People are warned, however, not to send egg-masses, as removing them is likely to break them and thus scatter the pest.

treated with creosote. Dead trees are removed and destroyed to prevent the overlooking of egg-masses under loose bark and in cavities.

A gypsy moth scouting crew consists of four or five scouts and a foreman. After a tree has been inspected an inspection mark is applied by the scout. If one or more gypsy moth egg-masses are found on a tree or on stones or débris near a tree, the last figure of the year in which the egg-mass was deposited is applied to the tree with white lead or crayon; for example, on infested trees this season the figure 4 is applied, since the egg-mass was deposited in the summer of 1934. Each tree thus marked is carefully watched. In heavily infested areas banding material is applied to the trees in the early spring to prevent caterpillars below the bands from getting into the tree. This not only helps to prevent defoliation, but also reduces the spread of the insect by keeping the small caterpillars out of the wind currents.

The complete eradication of a sizable gypsy moth colony has never been accomplished through only one method of control. Spraying is an important phase of the work. A solution of six pounds of powdered arsenate of lead to 100 gallons of water is applied to the foliage with the use of high-powered spray machines. The best results are obtained if the spray solution is applied after the foliage has reached its maximum growth.

Outbreaks of the gypsy moth are not new to New York State. The earliest one dates back to 1912, at which time a colony was found in Geneva, as well as one in Scotia, Schenectady County. Further outbreaks have occurred at Mt. Kisco, Westchester County, in 1914; Brooklyn and Roslyn, Long Island, 1920; and at Patchogue and Greenport, both on Long Island, 1921. In each of these cases extermination work was promptly initiated and within a period of two to four years complete eradication has been achieved.

During the above period and for many years previous thereto, the solidly infested gypsy moth area of New England was spreading out and approaching the New York border at an average of more than six air-line miles per year, and in 1922 the first New York colony in connection with the natural spread of the gypsy moth was found at Petersburg, Rensselaer County. The discovery of this and other small colonies that year prompted the barrier-

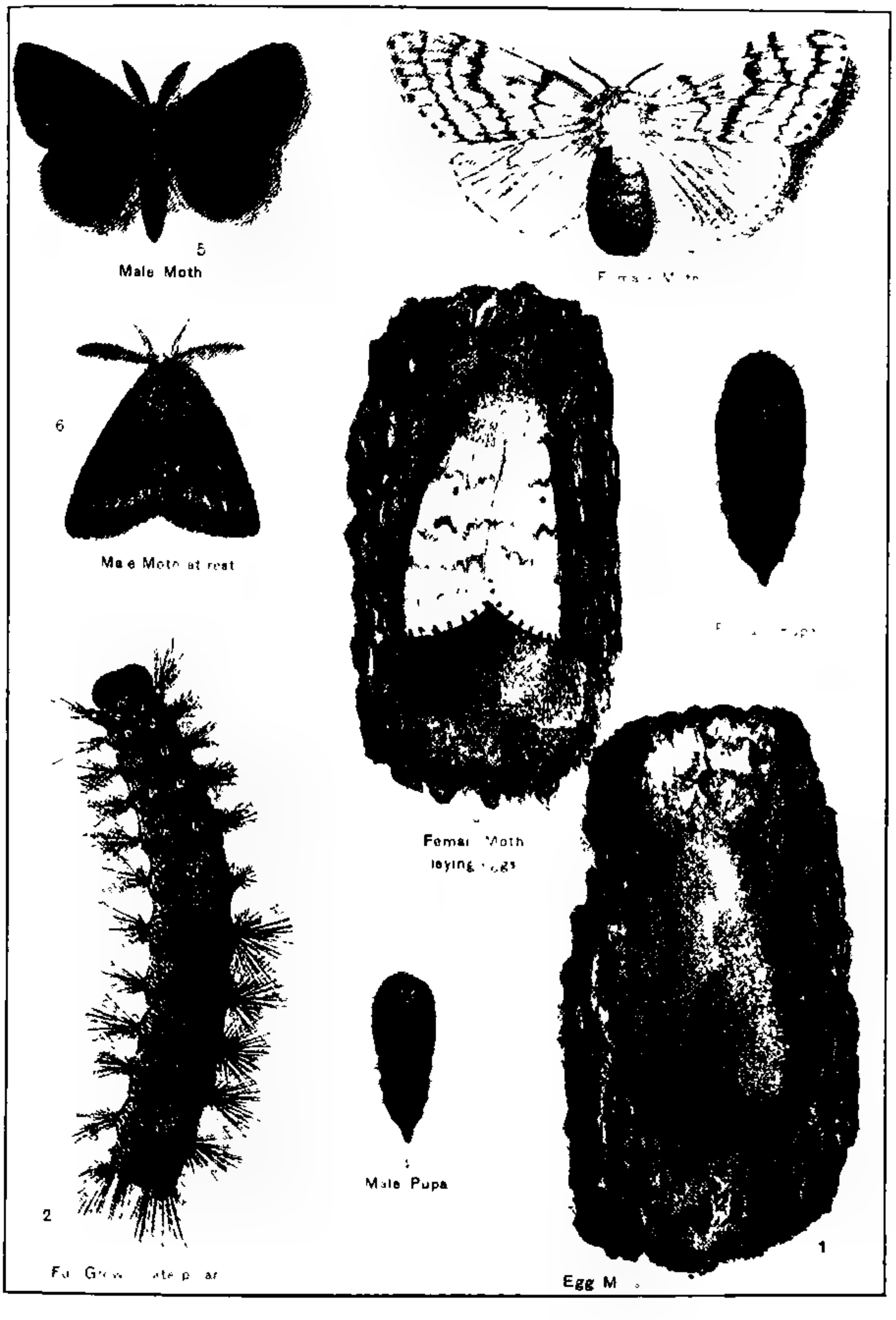

FIGURE 1. The gypsy moth in the successive stages of its life cycle, from egg cluster to adult, from a poster published by the State Conservation Department at Albany.

zone plan of control, which since that time has effectively prevented the further westward spread of this destructive insect. The barrier-zone comprises an area 25 to 30 miles wide, air-line measurement, paralleling the New York-New England boundary, from the Canadian border to Long Island Sound, aggregating some 8,000 square miles, about equally divided between New York and the New England states.

During the life of the gypsy-moth barrier zone (1923 to date) 100 widely scattered gypsy moth colonies were previously located in New York State. The distribution by counties is as follows: Albany, 1; Columbia, 29; Dutchess, 24; Essex, 2; Nassau, 2; Rensselaer, 16; Suffolk, 15; Queens, 4; Ulster, 4; Washington, 2; and Westchester, 1—an average of from eight to nine colonies per year.

A glance at the distribution of these colonies reveals the entire eastern part of the state, including Long Island, as implicated in the situation. The fact that none of the colonies developed to serious proportions is a credit to the barrier-zone plan of work, which calls for an inspection of certain parts of the zone each year, meaning a complete covering of the zone every few years. This plan has made it possible to locate the colonies shortly after they are established. While they are thus in the incipient stage, control work can be effectively carried on at moderate costs. When one considers the fact that previous to the establishment of the barrier-zone the westward spread of the gypsy moth had averaged more than six miles per year, and that it has been possible through the zone program absolutely to halt the spread of the insect for twelve years, the project looms as an outstanding accomplishment.

The topography and other conditions in the neighborhood of colonies previously found have been of an entirely different nature from those noted in The Bronx. Many effective control measures that can be applied in rural and remote woodland sections cannot be used at all in densely populated areas. The same applies when we consider our parks. Certain trees and shrubs have no particular value, either esthetic or commercial, in remote woodland sections, and they can therefore be removed, if necessary, but similar specimens in our parks are of outstanding value or at least of esthetic importance and should be kept if possible. The application of

gypsy moth control measures in the latter instances are often slow and rather costly.

These and other unusual conditions tend to make the Bronx gypsy moth problem one of the most difficult with which New York State has yet come in contact. A strong feeling of confidence is, however, entertained that if the intensive program of control that was started last September, with a coöperative arrangement between the New York Conservation Department and the Park Departments, can be continued without interruption, complete extermination, the goal which the program aims to achieve, will be accomplished.

H. L. McIntyre.

ASIATIC IMMIGRANTS IN THE BOTANICAL GARDEN—V.

Although only three vines are among the immigrant shrubs of the Garden, several others of the Asiatic invaders might be termed near-vines, for example, *Rosa multiflora* and *Rubus phoenicolasius*, the second of which is considered in this note. The vigorous shoots of these plants are greatly elongate and often give the shrub the appearance of a sprawling vine.

The barberry which is also treated here, on the contrary, is rigidly erect, though it has arching branches.

Barberries, at least considered in the broad sense, are circumtemperate. The species of *Berberis* are not quite so numerous as those of *Rubus*, but their geography is somewhat similar. Like that of the raspberries and blackberries, the genus is represented naturally on both sides of the North American continent.

In 1899 the wineberry (*Rubus phoenicolasius*) was introduced into the Garden from the Boehmer Nurseries in Japan. The genus *Rubus*—blackberries and raspberries—is well represented in America, Europe, and Asia. Although its species are most abundant in the Northern Hemisphere, some do occur in South America, and also in Africa, Australia, and New Zealand and most of the other southern Pacific islands. Some species are the direct source of large food supplies; other species have been crossed, the resulting hybrid sometimes producing an improved

and more abundant crop of fruits. The wineberry, a native of China and Japan, is an ornamental shrub. Although the flowers are not showy, the white undersurface of the leaflets and the cherry-red fruits are conspicuous and, in combination, often striking. The most noteworthy character of this plant and the one by which it is most readily identified is the dense growth of stiff red bristles covering the stems, twigs, and inflorescence. Through the scattering of its fruits it has become naturalized in thickets, fence-rows, and on roadsides, where it often covers an otherwise barren and unsightly bank of earth.

In 1896 the Thunberg-barberry (*Berberis Thunbergii*) was planted in the Garden in a half-dozen places. Botanically the barberries comprise a wide-spread genus of nearly a hundred species, which girdles the globe and in latitude extends from Alaska in North America to Cape Horn in South America. Asia, which excels in the number of species, has contributed many of them to horticulture through the agency of the botanical explorer. The genus *Odostemon* (*Mahonia*), sometimes included in the genus *Berberis,* also furnishes many horticultural subjects. A dozen additional Asiatic barberries have been set out in the plantations of the Garden, but none seems to have adopted the area as a home. The Thunberg-barberry, a native of Japan, is a very valuable and ornamental shrub. It is hardy throughout a wide latitude, and is remarkable for its dense, low, and even growth, being especially ornamental in autumn and winter on account of its red leaves and bright red fruits, which remain on the branches nearly through the winter, even in northern latitudes. The color of the fruits is attractive to birds, hence its wide dispersal, even in remote wild country.

JOHN K. SMALL.

SPRING LECTURES AT THE GARDEN

Suitable shrubs and flowers for different types of gardens are among the topics to be presented during the spring series of free lectures at The New York Botanical Garden. The lectures are given at 3:30 p. m. every Saturday afternoon in the Museum Building and all are illustrated with lantern slides. The complete schedule for March, April, and May follows:

March 2. "Little-known Ornamental Shrubs," Mr. Henry Teuscher, Dendrologist.
March 9. "Rock Garden Construction and Results," Mr. Charles Pfander, Assistant Superintendent.
March 16. "The Mycetozoa or Plant-Animals," Mr. Robert Hagelstein, Honorary Curator of Myxomycetes.
March 23. "Practical Rose Culture," Mr. Patrick McKenna, Foreman Gardener.
March 30. "Molds and Mushrooms That Cause Human Ills," Dr. J. Gardener Hopkins, College of Physicians and Surgeons, Columbia University, and Dr. B. O. Dodge, Plant Pathologist.
April 6. "South African Flowers and Scenery," Mrs. Jerome W. Coombs, Federated Garden Clubs of New York State.
April 13. "Annuals for the Garden," Mr. T. H. Everett, Horticulturist.
April 20. "Summer-flowering Bulbs," Dr. Forman T. McLean, Supervisor of Public Education.
April 27. "Spring Wild Flowers," Dr. John Hendley Barnhart. Bibliographer and Administrative Assistant.
May 4. "The New York Botanical Garden: Its History and Its Work," Dr. Marshall A. Howe, Assistant Director.
May 11. "Lilies for Gardens," Dr. A. B. Stout, Director of the Laboratories.
May 18. "The Flora of the Watchung Mountains," Dr. Harold N. Moldenke, Assistant Curator.
May 25. "The First Families of Florida and Their Crops," Dr. H. Beaman Douglass, Physician.

NOTES, NEWS, AND COMMENT

Returning the middle of February from five months spent in the most remote parts of Brazil, Mr. B. A. Krukoff has had sent to The New York Botanical Garden 18,000 specimens of plants, many of which are believed to be entirely new to science.

Dr. David D. Keck, of the Carnegie Institution of Washington, who spent ten days recently at the Botanical Garden here, addressed the regular monthly conference of the scientific staff and registered students of the Garden on February 14 on "Illustrations of the Experimental Method of Taxonomy." Ellys Butler Moldenke addressed the same meeting on "Problems in the Study of the Patellariaceae."

Dr. W. H. Camp, of Ohio State University, is spending two months at The New York Botanical Garden, investigating the taxonomy of the native blueberries.

Dr. E. D. Merrill and Dr. A. B. Stout have been elected honorary fellows of the Royal Horticultural Society in England and also honorary life members of the Pennsylvania Horticultural Society.

Dr. E. J. Schreiner, who addressed the Technical Association of the Pulp and Paper Industry in New York February 20 on the possibilities of improving pulping characteristics of pulpwoods by controlled hybridization of forest trees, visited the Garden while in the city, to consult with Dr. A. B. Stout on their joint work in hybridization of poplars.

The American Amaryllis Society, organized in 1933, has decided to include the genera Hemerocallis, Hosta, Leucocrinum, and Schickendantzia in its field for study, and is planning on having a treatise on these subjects in its 1935 year-book.

Elaborate plans for entertainment, as well as for visiting nurseries, gardens, and historic sites, are being completed now for the pilgrimage to the great spring flower show in Holland. Information about the trip may be obtained from the Horticultural Society of New York, which, in coöperation with The New York Botanical Garden and other organizations, is sponsoring the pilgrimage. The party will leave on the *Statendam* April 30, returning to New York, unless extension tours are taken, May 26.

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GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, tulips, lilacs, irises, peonies, roses, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical and horticultural literature, comprising nearly 45,000 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the autumn, winter and spring.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. Applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10
Garden Club Membership.....	annual fee for a club	25

Contributions to the Garden may be deducted from taxable incomes. Bequests may be made in the form of securities, money, or additions to the collections. The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

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THE NEW YORK BOTANICAL GARDEN

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JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

ANNUAL REPORT OF THE DIRECTOR FOR THE YEAR 1934
E. D. MERRILL

TREASURER'S REPORT FOR THE YEAR ENDING DECEMBER 31, 1934

SOUTH AFRICAN DISPLAY AWARDED TWO GOLD MEDALS
CAROL H. WOODWARD

THE ANNUAL BORDERS OF 1934
PATRICK J. MCKENNA

PROBLEMS IN THE STUDY OF THE PATELLARIACIAE
ELLYS BUTLER MOLDENKE

NOTES, NEWS AND COMMENT

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ANNUAL REPORT OF THE DIRECTOR FOR THE YEAR 1934

THE BOARD OF MANAGERS,
THE NEW YORK BOTANICAL GARDEN:

For your information the following summary report covering the year 1934 is submitted.

Again, through the practice of strict economy and in spite of our greatly reduced income, I report a successful year financially in that we have kept expenditures within the income and provided for the usual annual payment of $5,000 to capital to help meet the overdraft of previous years. Our actual income for 1934, from all sources, was approximately $340,131 as compared with $355,-131 for 1933, the reduction being almost wholly in the decreased city budget. Incomes from investments amounted to $118,619, practically the same as for 1933.

During the year our permanent endowment funds were increased by $29,814, of which $20,000 was received from the Britton bequest, the balance, $9,814, representing chiefly capital gains on sales and maturities of securities. Unrestricted gifts for current expenditures amounted to $622 and restricted gifts to $458. Through the beneficence of the late N. L. Britton the Garden is to receive two-twelfths of his estate, such share being estimated at $35,000. Late in the year, $10,000 was bequeathed to the Garden by the late K. K. MacKenzie, a member of this Board, to be utilized in finishing and publishing his illustrations of Cyperaceae, his drawings as far as finished also being bequeathed to the Garden.

Because of the magnitude and diversity of operations, and the numerous changes made in 1934, it is difficult to summarize briefly

the actual accomplishments made. Only the more important items can be mentioned, yet many of these are of the utmost significance.

Staff Changes

Mrs. N. L. Britton, Honorary Curator of Mosses, died on February 25. In her honor the great reference collection of mosses, now covering 169,725 specimens, was named the Elizabeth Gertrude Britton Moss Herbarium, as it was through a lifetime of active work and her deep personal interest that this great collection was assembled. It is one of the greatest collections of this sort of material in the world, containing many thousands of types and important historical specimens.

On June 25, 1934, Dr. N. L. Britton died at his home in New York. He was Director-in-Chief of the Garden from the time of its establishment in 1898 to his retirement in 1929 at the age of seventy years, and Director Emeritus up to the time of his death. To him more than to any other one individual is due the establishment and development of The New York Botanical Garden, and the Garden is indeed a monument to his memory.

Mr. William Becker, Foreman Gardener, in charge of Range I, died on July 11, 1934.

The technical staff remained as in the past year, with the addition of Dr. Harold N. Moldenke as Assistant Curator, the creation of this position being rendered possible through the adjustments that were made when the position of Head Gardener became vacant through the departure of Mr. Boynton in August, and the immediate assumption of his duties by Mr. Everett.

In the outside staff, including gardeners, guards, and special employees, twenty changes were made. Superannuated employees were retired or demoted to positions and salaries more commensurate with what they could render in return, and inefficient or otherwise unsatisfactory employees were eliminated. Their places were filled with carefully selected men and the entire outside force was placed under the very efficient management of Mr. A. C. Pfander, who was appointed as Assistant Superintendent in charge of grounds in August. The results of these changes are far-reaching, rendering it possible for us to prosecute vigorously the general renovation of the grounds and rehabilitation of the inside and

outside plantings in spite of our reduced budget, because of the very greatly increased efficiency of the staff.

City Relations

Our city relations are excellent, as we have full support of the Park Department and of the Administration in the productive changes instituted at the Garden in reference to staff changes, emergency repairs, and the general improvement of the buildings and grounds. Through the Department of Sanitation arrangements have been consummated for filling the old lake bed, long a serious problem. The retaining-wall and iron fence opposite our propagating grounds have been completed, and the more extensive retaining-wall opposite the North Meadow, Bronx Park East, is under entire reconstruction, with the work well advanced. An actual increase of $5,550 in the city budget for 1935, as contrasted to a reduction of $13,230 in 1934, will enable us to make certain much-needed changes in the coming year. The stringent regulations pertaining to vacancies have been modified, so that it has become possible for us to fill important positions vacated by reason of death or by resignations.

Buildings and Grounds

Unprecedented progress has been made during the past year, almost entirely due to the magnificent support accorded to the Garden through the Works Division of the Department of Public Welfare, supplemented by needed support from the City for emergency repairs. Time and space do not permit great detail, the outstanding accomplishments being listed below.

An entire renovation of the Museum Building is in progress, involving inside and outside repairs as needed, painting of the entire interior, and the woodwork on the exterior, with authority already granted for a much-needed new roof. Much work has already been consummated and the task should be finished this winter. Other improvements include: painting the entire boundary fence, all inside fences, several thousand feet of guard-rails, the interior and exterior of Range I, and the stable; construction of the rock garden wall, a magnificent piece of masonry, five hundred feet long and about three feet high, construction of dry retaining-walls as needed adjacent to paths; pointing up of the fountain on the main drive;

resetting of the parapet wall of Power House No. 1, and lecture hall roof; construction of stairways and sidewalks at Power House No. 1, construction of much-needed new and permanent masonry coldframes in the propagating grounds; 5,000 feet of new tarvia paths, telford base; resurfacing of 1,200 feet of tarvia paths, reconstructing and resurfacing as needed; 2,600 feet of paths in the Hemlock Grove; construction of the Rose Garden drain, 125 feet long, cut in rock to a maximum depth of 12 feet; a new timber bridge over the Bronx River, North Meadow, 44 feet long and 10 feet wide; excavation for a new root storage cellar, 20 x 40 feet, at Range 2; excavations in connection with the reconstruction of the power line from Power House No. 1 to the Museum Building and construction of a 76-foot drain to care for excess water in the trench (this project is a $50,000 task, and when completed it is estimated that it will effect an annual saving of about 40 per cent in the amount of steam needed to heat the Museum Building); asbestos insulation of the steam line, 715 feet, to Range 1; general forestry and landscaping work; Japanese beetle control; filling and grading in the old lake valley and in the North Meadow; construction of rustic rails and fences, with stone and concrete steps as needed in the Hemlock Grove; installing of new wire fence with two gates at the Thompson Memorial Rock Garden, 1,200 by 6 feet (Garden funds); construction of a 475-foot path in the Rock Garden, and general Rock Garden work.

Twenty-four concrete incinerators were secured from the Park Department and strategically placed, materially contributing to the solution of our refuse and waste-paper problem. The acquisition of one new dump truck, one motorized side-bar grass cutter, and one new motorcycle for the use of one of our guards is a long step forward in our program of motorizing our equipment and thus increasing the efficiency of our laborers. A large reserve of rotted leaves, compost, and manure, much needed in garden operation, has been built up, most of the nursery space has been entirely rehabilitated, some two hundred young trees have been planted in various parts of the grounds, and a general program of tree-pruning and tree-feeding has been initiated. At Range 2, in the fenced yard, extensive areas have been graded, walls constructed, and additional propagating beds and frames installed for much-needed expansion of our outdoor growing space. Preliminary work has been done

on plans for a new garage, this being based on the alteration and expansion of the space under the Third Avenue Elevated causeway. Through a special emergency appropriation of $4,500 granted by the City, all boilers at Power House 1 were reset, and necessary alterations of the floors were made at the same time. Negotiations are under way with the Park Department in reference to the possible construction of a new north and south main driveway along the western boundary of the Garden.

The Park Department has completed the construction of the mosaic masonry wall on Bronx Park East opposite the propagating grounds, a linear distance of 1,050 feet, averaging 12 feet high, and the iron boundary fence topping this wall throughout its length has been installed and painted. The Borough President's office through the Department of Highways has undertaken the reconstruction of the high retaining wall on Bronx Park East opposite the North Meadow, necessitated by a bad cave-in last year. This wall is 865 feet long and averages 20 feet high. The project, now well advanced, is to be finished in the early months of 1935.

Emergency Relief Bureau Relations

In our coöperative arrangements with the various relief agencies in New York, commencing with the Emergency Work Bureau in November, 1930, we have been most fortunate. At all times since that date we have had few to many temporary employees assigned to the Garden. In November, 1933, the Emergency Work Bureau operations were taken over on definite projects by the Civil Works Administration, and since this ended in April, 1934, they have been carried by the Works Division, Department of Public Welfare, now the Emergency Relief Bureau.

The work is organized under two projects, one largely for outside work, mostly men, engaged on construction and repair work (Works Division Project 89–Bd–32); the other, mostly women, for inside work (Service Project 89 Fg–209–X).

The number of individuals in the first project varies, averaging 150 men. This group is organized under its own supervising engineer, who works in coöperation with our own staff on the basis of definite approved subprojects, mostly on construction and repair work, covering a very wide field of needed improvements. To it is at present allocated a monthly budget of $1,500 for supplies and

materials. Under the auspices of this group most of the productive work accomplished during the year and listed under buildings and grounds has been done.

The original quota on the second project was 75, the present number of employees actually working five days each week being 65. They are classified in several categories, including artists, librarians, technicians, stenographers, typists, and clerks. This group is organized on subprojects covering a great variety of activities, few to many individuals, according to their training and experience, being assigned to regular employees of the Garden to assist in prosecuting work in which these staff members are individually interested, and in the actual accomplishment of productive work for the benefit of the entire institution.

Thus all or most of the records of exchanges and loans, checking of library references, much of the bibliographic work, much current stenographic work, all of the routine work of poisoning, mounting, and distributing specimens into the herbarium, typing descriptions and clipping original descriptions for insertion into the herbarium, making card catalogues and indices, photography, lantern slides, water-color paintings and line drawings, technical laboratory work, including imbedding, section-cutting, staining and mounting, and making slides, culture transfers and other similar activities, preparation of labels for duplicates, making up sets of duplicates for exchange purposes, handling the routine of our seed exchange, and numerous other activities are being efficiently prosecuted, thus adding tremendously to the output of the staff of the institution. The magnitude of the productive work may be indicated by a few special items, such as the actual poisoning, mounting, and distribution of 70,150 specimens within the year, the entire rearrangement of our reference collection, approximating 1,774,000 specimens, cleaning and repairing of more than 110,000 specimens within the year, the preparation and incorporation into the reference collection of somewhat in excess of 100,000 original clipped or typed descriptions within the year, the actual preparation of more than 75,000 index cards for various purposes, the checking on the originals in our library, and others, of somewhat in excess of 20,000 bibliography entries in all European languages as well as the Chinese and Japanese. All these and many other activities prosecuted by the now well-trained and experienced efficient group,

more than any other one factor has enabled the Garden to weather the storm of adversity in its greatly reduced budget and at the same time greatly increase its productive and service output. All expenditures for supplies and equipment for the 65 workers now assigned to the Garden on Service Project 89–Fg–209 X, have been purchased from Garden funds, no small item in itself, this being a part of the coöperation of the Garden in providing work for those who through no fault of their own are in desperate need of assistance.

To the Emergency Work Bureau, financed from private funds, that carried the entire group for several years, and is still sending special cases to the Garden; the Civil Works Administration, that took over the group when that organization was created; the Works Division of the Department of Public Welfare that in turn took over the projects when the C. W. A. ceased to function; and the latter's Emergency Relief Bureau now carrying on, the Garden is under a tremendous debt of gratitude for the very material and extensive assistance extended to it during the past year, and the years immediately preceding 1934.

The approximate amounts expended during 1934 at the Garden by the Emergency Relief Bureau, City of New York, are tabulated below, with brief indications of the work accomplished. Such monies were disbursed directly by the Emergency Relief Bureau and hence are not reflected in the Garden accounts.

Works Divisions Project 89–Bd–32

Grounds	Material	Wages	Total
Paths	$11,200	$20,000	$31,200
Rock Garden	2,000	20,000	22,000
Painting (fences and buildings)	2,000	3,000	5,000
Re-construction of steam trench	1,000	1,000	2,000
Drainage and catch basins	500	4,000	4,500
Timber Bridge over Bronx River	800	1,000	1,800
Repairs to Power House	500	1,000	1,500
Forestry and general repairs	60,000		60,000
			$128,000

Service Project 89–Fg–209–X

Wages paid to an average of sixty women, each working five days per week, for inside work in the laboratories, herbarium, museum, and offices	55,000
Total	$183,000

GREENHOUSES

Outstanding advances have been made in this field in spite of the severe handicap of budgetary limitations, resulting in a shortage of needed labor, with little available for the purchase of needed supplies and material. With the departure of Mr. Boynton in August, his entire duties were taken over by Mr. Everett. Certain vacancies created, some by death and some by demotion of superannuated employees, were filled with young, well-trained, active men. Four new student gardeners and two apprentice gardeners were appointed, all intelligent, industrious, competent, and ambitious men. The living collections have been distinctly increased by gift, exchange, purchase, and the actual growing of material. This particularly applies to the South African types, cacti, succulents, and rock-garden plants. About 400 living plants were secured by Mr. Everett in England and brought with him on his return from England in September.

In Range 1 a complete inventory of all living plants has been made, the identifications are being checked as far as possible, labels are being changed, and the various collections rehabilitated. The benches in house 6 were lowered and the large center bench in house 7 removed entirely. The cactus collections in the latter house are now being planted in a large ground bed which will add infinitely to the attractiveness of the plantings, and which will result in much better specimen plants. In house 11 the central part has been excavated preparatory to filling with properly prepared soil wherein to plant the bananas and their allies, to obviate the use of large tubs in which these plants have, hitherto not too successfully, been grown. The display collections maintained in house 6 continue to attract most favorable comment on the part of the visiting public.

In Range 2 the soil of about one third of the space covered by the central display house was removed and replaced with better material and the plants have been rearranged for better effect. A small rock-bound pool in natural style was constructed to replace the circular one in front of the main entrance. Large quantities of decorative plant material for display in Range 1 have been grown, and stocks of selected ornamental tender species have been propagated to the extent that they can now be effectively exhibited. The orchids continue to show substantial improvement, while the collec-

tions of Begonias and of South African bulbous plants are in splendid condition.

Outside Plantings

The flower borders surrounding Range 1 were entirely replanted in such a way that a definite character was given to each section, including annuals sown *in situ,* beds of standard Fuchsia with Petunia and Alyssum, a wide variety of half-hardy annuals, hardy Chrysanthemums, etc. The court beds were planted formally. The old Canna-Salvia triangle was replaced by a Verbena-Hunnemannia combination, while the Canna collections were maintained near the Fordham Hospital entrance. Some 3,000 Chrysanthemum plants and about 24,000 tender plants were raised for these outside plantings.

In the Thompson Memorial Rock Garden extensive planting was accomplished in the spring, and 7,500 bulbs were planted in the fall. While the construction work on this project is as yet unfinished, because of labor shortage, much has been accomplished and the development yields most favorable comment. Additional construction work will be done in 1935. The entire area has been placed under fence.

An important step was the establishment of a much-needed reserve garden in which material for the Advisory Council's perennial border and other flower beds can be raised. This was especially desirable in view of the fact that reserve material will be needed next spring because of the fact that bulbs will no longer be supplied by the Holland Bulb Exporters Association. There are now approximately 7,000 plants in the reserve garden.

In August the alphabetized Iris, some 3,900 plants representing 1,068 varieties, were removed from their former site and replanted in newly prepared beds contiguous to the Iris garden proper. In the fall much basic work on improving the soil in the beds and borders was executed, including the double digging and fertilizing of the entire border west of Range 1, the Dahlia beds, and one fourth of the Advisory Council border. Other beds were deeply dug and fertilized.

About 450 evergreen trees presented by Colonel Montgomery were planted, while small plants representing 85 species and varieties from the same source are being grown for us at the Boyce Thompson Arboretum. In November the gift of a carload lot of

well-grown nursery stock, 1,445 items, from the Farr Nursery Company, gave us the much-needed material to extend our plantings of ornamental trees and shrubs. Three hundred four- to five-foot hemlock trees were acquired and planted, as needed, in the Hemlock Grove in continuation of our rehabilitation plans for that most interesting and important part of our grounds. Several thousand cuttings of ground-cover plants—Hedera, Pachysandra, Vinca, Arctostaphylos, and Lonicera—are being raised for planting in selected areas. Important background and blockout plantings have been established near the traffic circle, along Bronx Park East, along the New York Central Railroad tracks, and in other parts of the grounds, these plantings being rendered possible by the large gifts mentioned above.

The Narcissus, Tulip, Peony, Iris and Dahlia displays were particularly beautiful and attracted the usual or an increased number of visitors. The estimated attendance at the outstanding Dahlia display on single Sundays in the fall was 10,000 persons. Much favorable comment was received from the visiting public and by letter regarding the excellence of the floral displays.

Winter Injury

The unusually severe winter of 1933–34 caused a great deal of winter-killing of trees, shrubs, and vines, on which a special report was prepared and published by Mr. Teuscher. This has necessitated a great deal of extra pruning, dead branches being removed from shrubs and trees from early summer to date in all parts of the Garden. The work is being continued.

Library

The bound volumes at the end of the year stood at 44,059, an increase of 630 over 1933, the additions being acquired by gift, exchange, purchase, and binding. Additional cards in the card catalogue totaled 6,368. Nine new serials were added to the list of those currently received.

Reference Collections

The total accessions from all sources intended for incorporation into the herbarium amounted to 41,520 specimens, with considerably in excess of this number in the form of duplicates to be used for exchange purposes. Of these, 8,020 were purchased, 16,239 were received in exchange, and 11,528 in return for identification,

from various parts of North and South America, the West Indies, Central Africa, China, Indo-China, Siam, the Caroline Islands, New Guinea, Solomon Islands, Fiji, the Philippines, and Sumatra. By gift, 4,926 specimens were received, the remainder by actual collection. Practically all recent accessions and much valuable material from storage were poisoned, mounted, and distributed into the herbarium, the total number being 70,150. In addition, about 12,000 specimens were mounted for the Gray Herbarium and the Arnold Arboretum of Harvard University and the Philadelphia Academy of Natural Sciences. The number of specimens mounted very greatly exceeds the number handled in any one year in recent times. The total number now available for consultation and study is 1,774,687, the second largest collection in America.

Outstandingly important collections received for study were about 2,600 numbers, with approximately 18,000 duplicates for the Brass collection of the Richard Archbold expedition to New Guinea, and 2,000 numbers, about 16,000 duplicates, collected in Fiji by Dr. A. C. Smith of the Garden staff on the basis of a Bishop Museum fellowship from Yale University. In exchange, 22,283 specimens and 447 photographs of types were distributed to various institutions in America, Europe, and Asia. One hundred thirty-eight loans, covering 8,927 specimens, were made to other institutions in North and South America, Europe, and Asia, while we borrowed 66 lots, involving 7,130 specimens, for the use of our own staff members.

The liberal loan policy adopted in reference to study material has resulted in the most cordial relationships between the Garden and other domestic and foreign herbaria, to the distinct benefit of taxonomic research, for, as we grant loan privileges to other institutions, these in turn favor us.

The value of the reference collection has been tremendously enhanced through the actual incorporation of several hundred thousand clippings of original descriptions and critical notes, or typed or photostat copies of such data, a policy adopted several years ago, and now being vigorously prosecuted through the service of a trained corps of temporary employees. This policy of "putting the library into the herbarium" results in a tremendous amount of time-saving on the part of all staff members and visitors, rendering it unnecessary in a high percentage of cases to take the time to look up references in the library, as direct comparisons with original

descriptions can now be made in the herbarium wherever the descriptive data have been inserted.

The collection of algae and hepaticae under the supervision of Dr. Howe, of the fungi under the supervision of Dr. Seaver, and of the mosses and lichens under Mr. Williams have shown satisfactory growth, and in several of these units the policy of clipping and adding descriptions associated with the specimens has been adopted.

The very large number of mounted specimens added in the past five years, exceeding 200,000 sheets, is beginning to tax the capacity of the present herbarium space and we must look forward to a distinct enlargement of storage space, in the near future. The ideal would be steel cases, but because of the cost item, temporary expedients in the use of less permanent and satisfactory casing may have to be adopted.

Pathology

In plant pathology the most disconcerting note was the actual discovery of three trees in the garden infested with the Dutch elm-disease; these were felled and burned immediately. The disease is widespread in the vicinity of New York. The Japanese beetle during the past summer for the first time caused noticeable damage to plants in the garden, and in spite of all that can be done to control it, it will probably become increasingly abundant, as was the case with its relative, the Asiatic beetle. Trapping was resorted to, with sufficient success to recommend its wider use next season. Sample diggings in the lawns treated with arsenate of lead in 1932 showed a remarkable degree of control, and the arsenate of lead treatment will be greatly extended. Productive research has been extended to numerous fungus diseases of cultivated ornamentals. During the year we have had the assistance of three foreign graduate students in the laboratory, Dr. Alice Aronescu of Roumania, Dr. S. M. Pady of Canada, on a National Research Council Fellowship, and Prof. F. L. Tai of China, on a China Foundation Fellowship.

Laboratories

Plant breeding has been largely confined to *Hemerocallis*, native southern *Iris*, and *Lilium*, while the coöperative project on hardy seedless grapes has been continued with the Geneva Experiment Station. *Hemerocallis* is being studied from the standpoint of taxonomy, hybridization, selective breeding, sterility, and fertility.

Many new and attractive types have been developed. In *Iris* the objective is to hybridize the more southern forms with the northern ones to combine the colors of the southern forms with the hardiness of the northern ones. In *Lilium* attention has been given to the status of various types of *L. tigrinum,* their sterilities, cytology, and botanical status, as well as to the problems concerned with the mosaic disease. In the seedless grape project, because of the very severe winter of 1933–34, few plants fruited. With few exceptions, however, the seedlings at Geneva made excellent growth and many will undoubtedly fruit in 1935.

Registered Students

The following students were registered during the year:
Aronescu, Alice, Plant Pathology.
Cobin, Milton, Taxonomy.
Du Blis, John, Taxonomy.
Ericson, Alma, Course 308.
Eves, Donald Smith, Taxonomy.
Eves, Roland Guy, Taxonomy.
Fulling, Edmund H., Morphology and Taxonomy.
Hershkowitz, Isador, Sterility and Reproduction.
Le Vann, Leon Jan, Cytology and Plant Breeding.
Lillick, Lois Carol, Study of Algae.
Moldenke, Harold N., Taxonomy.
Moldenke, Mrs. Ellys Butler, Taxonomy of Fungi.
Pady, Stuart M., National Research Fellowship.
Saitta, Joseph, Pathology and Insect Control.
Schweizer, Olga, Cytology and Plant Breeding.
Tai, Fang-lan, China Foundation Fellowship, Pathology.

Of these A. Aronescu, E. H. Fulling, and H. N. Moldenke completed their work and received the Ph.D. degree from Columbia University in June.

Public Education

Aside from the School for Professional Gardeners discussed below, both the spring and fall extension courses in gardening continue to be well attended. Special courses on ferns and on trees were repeated during the year, with fair attendance. During the three summer months the popular Saturday afternoon lectures were eliminated. At the thirty-seven lectures given the total attendance was 3,424. Demonstrations for special groups and high school students were continued, serving 2,263 individuals. Sixty

outside lectures were given by staff members to various organizations. Coöperative work with the American Institute is being continued in its junior science student work, one special course being conducted, with an enrollment of twenty-two high school students.

School for Professional Gardeners

This activity, which meets a much-felt need, has been continued in coöperation with the National Association of Gardeners and the Horticultural Society of New York. Twelve of the students who took the two years' course for credit completed the work satisfactorily and were granted their certificates with appropriate ceremonies on April 9th. The course, now in its third year, has a total enrollment of seventy-two students, taxing the capacity of the rooms of the Horticultural Society to care for them properly. Two thirds of these are taking the work for credit with view to securing their certificates. It is interesting to note that similar courses were instituted in 1934 in Boston and Philadelphia.

Seed Exchange

The first official seed exchange of the Garden, initiated in January, 1934, resulted in 5,703 packets being sent to 121 different institutions and 4,187 packets received from 61 gardens; in addition to the official seed distribution, Dr. Small reports the distribution of several thousand packets of Iris seeds, mostly in lots representing about 200 species, to a limited list of individuals. In December the second seed list was prepared and is now being printed.

Distribution of Excess Stock

Twice during the year surplus stock amounting to several thousand plants was distributed to members of the Garden, the first covering Begonias, Chrysanthemums, and Iris, the second Daylilies. Much surplus stock, greenhouse and outside plants, including shrubs, was presented to the public schools. In addition to this official distribution, Dr. Small reports the distribution of about 1,000 Iris plants, representing species of the southern states.

Exhibits

Exhibits were staged at the International Flower Show, the Westchester Flower Show, the Brooklyn Fall Show, and the Fall Exhibition of the Horticultural Society of New York, all of which received recognition in the form of medals and special prizes. The Garden coöperated with the Garden Club of America in growing

the plants for its exhibit of Begonias, and with the Federated Garden Clubs of New York State for its special exhibit on methods of propagation at the International Flower Show.

The forty aquaria installed in the Museum building in December, 1933, were maintained until the end of April, the special collections of aquatic plants maintained therein creating much interest and attention. Since the exhibit was removed we have installed and are maintaining several aquaria in which to grow aquatic plants for study purposes.

Advisory Council

I am pleased to report the continued interest of this group, not only in reference to the projects in which they are interested, but also in the general plantings and in the activities and accomplishments of the technical staff. Through its continued coöperation and support, the Council's Perennial Border has been maintained and improved and assistance and advice have been extended to other projects.

Vandalism

Deliberate and thoughtless vandalism is always with us and is difficult to control because of the size and nature of the grounds and because we do not have a sufficient number of guards. Thus on the night of May 12, preceding Mother's Day, a very considerable number of Tulip flowers were taken from the display beds. To protect the cacti against thieves in Range 1, it has been necessary, as in various other European and American botanical gardens, to install locked iron screens on the side benches, because of the very wide popular interest in these plants; it is usually the more rare plants that are taken. Recently all of the aquatic plants in the standard aquarium, Range 1, were stolen. In the course of the year about thirty signs were stolen or destroyed or so badly injured, chiefly by boys, that they had to be replaced, and at the same time a very much larger number of display labels were displaced or broken. Because of this condition the grounds of the new Thompson Memorial Rock Garden, two and a half acres, have been placed under permanent fence, and the future fencing of other areas within the Garden is indicated as a highly desirable feature. It is possible that if the coöperative plans of the New York Bird and Tree Club materialize, we may be able to fence a tract of about nine acres in 1935 as a bird and plant sanctuary. Another project under consideration is the fencing of still another area to be devel-

oped as an officinal plant garden. The situation has materially improved through the action of the Police Department, on our representation of the situation, assigning a mounted policeman to patrol the garden. This began in July and is still continued. The addition of a motorcycle patrol, one of our own employees, has contributed materially to the solution of the problem.

Gifts

Gifts during the year included volumes for the library, donations of living plants (outstandingly important and extensive ones being about 600 items from Colonel Montgomery and 1,445 items from the Farr Nursery Co.), and an extensive series of herbarium specimens, including a very interesting collection of dried plants from the Hudson River Valley, collected over a hundred years ago and sent by a correspondent in Oregon. In November an official acknowledgement form was adopted in order that we might maintain at least approximate records. The tabulation of entries for the last two months of the year indicates the following accessions as gifts, but does not include exchanges or material purchased.

Living plants	1,540	Herbarium specimens	363
Bulbs	1,792	Books	18
Packets of seeds	55	Reprints for clipping	180

Honors

Doctor Howe was reëlected as President of the New York Academy of Sciences, Dr. Dodge has been elected President of the Mycological Society of America, while the undersigned was selected to serve as one of the two Presidents of the Section of Taxonomy and Nomenclature, Sixth International Botanical Congress, Amsterdam, September, 1935, and was also selected to represent the Botanical Society of America on the National Research Council.

Publications

The receipts from sales of publications amounted to $5,512, a decrease of about $746 from that of the preceding year. Twelve numbers of the Journal, two of the *North American Flora,* two of *Addisonia,* one of *Brittonia,* with a second in proof, and six of *Mycologia* were issued. Work is far advanced on several other numbers of the *North American Flora,* data for at least four numbers being now in proof. The index volume of the first twenty-

four volumes of *Mycologia* and Gleason's "Plants of the Vicinity of New York" are in proof. During the year about 132 technical and semi-technical papers prepared by members of the staff were published in various periodicals, some of these being distinctly extensive and important.

Memberships

Like most other institutions of the type, we still continue to suffer a loss in membership. The Committee reports 45 new members, but the loss by death and resignation is 185, a net decrease of 140 during the year, 45 less than the preceding year. Dues collected amounted to $11,695, this being $595 less than for 1933.

There are at present 101 Life Members, three Fellowship Members, 90 Sustaining Members, and 1,231 Annual Members. Some of these are in arrears for dues and a further decline is to be expected. In a special category known as Garden Club Membership, where special privileges are extended to Garden Clubs, five organizations have taken out memberships and others are considering it.

Conclusion

As in my last annual report I make no specific recommendations covering possible expansion of our work, for expansion depends largely on increased income. Rather we should continue internal reorganization, enlarging and increasing our activities as it becomes possible to do so on the basis of our present income, and modifying present activities as needed to meet changing conditions. Much has been accomplished during the past year, but much remains to be done. The morale of the staff was distinctly better than was the case in 1933, with a much better spirit of coöperation in evidence. The outlook for 1935 is distinctly better than it was in 1934, and while the situation of this, like other tax- and endowment-supported institutions, may from some standpoints be considered to be somewhat critical, again at this the close of the fifth year of the economic depression I thank the very numerous individuals and organizations that have assisted the Garden and bespeak the continued harmonious support of all who have the interest of the institution at heart.

E. D. Merrill,

New York, N. Y.,
January 1, 1935.

TREASURER'S REPORT FOR THE YEAR ENDING DECEMBER 31, 1934

EXHIBIT I

BALANCE SHEET

December 31, 1934

JOHN L. MERRILL, Treasurer

ASSETS

Permanent Fund Assets:			
Investments at cost or appraisal at time of acquisition (Exhibit III)	$2,445,314.92		
Cash awaiting investment	38,486.21		
		$2,483,801.13	
Balance of permanent fund assets expended for current uses (see current fund liability, per contra)		9,909.32	
			$2,493,710.45
Current and Working Assets:			
Cash in banks and on hand:			
For general purposes	$ 6,266.75		
For special purposes	6,520.29		
		$ 12,787.04	
Accounts receivable:			
City maintenance	14,282.74		
Interest and dividends receivable (Exhibit III)	31,612.02		
Prepaid insurance premiums, etc.	1,138.88		
		59,820.68	
			$2,553,531.13

EXHIBIT I

BALANCE SHEET

December 31, 1934

LIABILITIES

Permanent Funds (Exhibit IV):			
Restricted endowments		$ 222,200.10	
Unrestricted endowments, including bequests set aside by the Board of Managers as permanent funds		2,250,351.53	
Special endowment with life interest in respect of income therefrom.		21,158.82	
			$2,493,710.45
Current Liabilities and Special Funds:			
Current liabilities:			
Accounts payable . .		$ 6,986.58	
Special funds (Exhibit V):			
Unexpended income from restricted funds . . .	$ 5,198.09		
Unexpended contributions set aside by the Board of Managers for specific purposes ..	1,322.20		
		6,520.29	
Deferred income credits:			
Membership dues paid in advance	$ 150.00		
Subscriptions and fees paid in advance	759.50		
		909.50	
Balance of indebtedness to permanent funds for expenditures of fund assets for current uses		9,909.32	
Working fund:			
Working fund at December 31, 1933	$ 26,308.07		
Add—Excess of unrestricted income over expenditures for the year ending December 31, 1934 (Exhibit II)	9,186.92	35,494.99	
			59,820.68
			$2,553,531.13

TO THE BOARD OF MANAGERS OF

THE NEW YORK BOTANICAL GARDEN:

We have made an examination of the balance sheet of The New York Botanical Garden as at December 31, 1934 and of the statement of operations for the year 1934. In connection therewith, we examined or tested accounting records of the Garden and other supporting evidence and obtained information and explanations from officers and employees of the corporation; we also made a general review of the accounting methods and of the income and expense accounts for the year, but we did not make a detailed audit of the transactions.

In our opinion, based upon such examination, the attached balance sheet (Exhibit I) and related statements (Exhibits II to V, inclusive) fairly present its position at December 31, 1934, and the result of its transactions for the year.

PRICE, WATERHOUSE & CO.

56 Pine Street, New York, April 5, 1935.

EXHIBIT II

Statement of Operations for the Year Ending December 31, 1934

		Total	Restricted and special funds	Unrestricted
Income:				
Income from investment of permanent funds		$119,451.64	$ 9,918.02	$109,533.62
Contributions:				
City maintenance		200,698.07		200,698.07
Other		834.00	212.00	622.00
Membership dues:				
Annual		9,625.00		9,625.00
Sustaining		2,050.00		2,050.00
Sales of duplicate books and sundries		1,866.71	969.35	897.36
Subscriptions and sales of publications		5,536.47	4,129.00	1,407.47
Total income		$340,061.89	$15,228.37	$324,833.52
Expenses:				
Horticulture:				
Outdoor	$34,250.89			
Indoor	62,155.23			
Propagating house and nursery	9,847.06			
		$106,253.18	$ 2,686.97	$103,566.21
Science and curating:				
Herbarium	$24,234.92			
Research and experiment	10,671.15			
Abstract study	5,429.22			
General	3,940.59			
		44,275.88	3,732.90	40,542.98
Library:				
New books and bindings	$ 2,916.36			
Bibliographic research	2,410.94			
Supervision, assistants, supplies, etc.	5,654.96			
		10,982.26	3,129.98	7,852.28
Education:				
Public instruction and lectures	$ 9,922.21			
Graduate instruction	2,133.61			
Photography and slides	4,423.25			
Museum collections and exhibits	2,523.58			
		19,002.65	1,577.89	17,424.76
Publications		16,608.63	4,953.27	11,655.36
Administration		40,306.40		40,306.40
Care and upkeep:				
Grounds	$41,168.04			
Buildings	44,296.64			
		85,464.68		85,464.68
Improvements and equipment purchases		10,561.62	1,727.69	8,833.93
Total expenses		$333,455.30	$17,808.70	$315,646.60
Excess of income over expenses for the year		$ 6,606.59	$-2,580.33	$ 9,186.92

EXHIBIT III

Summary of Investments, December 31, 1934

	Par value (No par value stocks at book values)	Approximate quoted value	Book value	Accrued interest and dividends December 31, 1934	Average yield per year on basis of	
					Quoted value	Book value
					%	%
General funds:						
Bonds . . .	$ 553,350.00	$ 553,531.61	$ 545,042.01	$ 7,123.86	4.82	4.89
Stocks:						
Preferred	65,830.00	80,177.50	71,337.50	868.33	5.02	5.64
Common	20,268.80	4,726.75	20,268.80			
	$ 639,448.80	$ 638,435.86	$ 636,648.31	$ 7,992.19	4.81	4.82
Sage fund:						
Bonds	$ 574,000.00	$ 575,288.75	$ 526,491.86	$ 9,530.00	4.52	4.94
Stocks:						
Preferred	135,611.25	145,395.25	138,873.76	831.25	4.38	4.59
Common	73,300.00	119,889.00	101,298.62	2,221.50	7.41	8.77
	$ 782,911.25	$ 840,573.00	$ 766,664.24	$12,582.75	4.91	5.38
Special endowment fund:						
Bonds ..	$ 104,000.00	$ 107,475.00	$ 103,869.75	$ 1,685.83	4.37	4.52
Stocks:						
Preferred	307,500.00	347,818.75	374,319.38	3,412.50	4.58	4 25
Common	21,400.00	19,104.00	43,709.03	345.00	7.22	3.16
	$ 432,900.00	$ 474,397.75	$ 521,898.16	$ 5,443.33	4.64	4.22
John D. Rockefeller, Jr., fund:						
Bonds .	$ 253,000.00	$ 273,276.25	$ 256,407.75	$ 3,600.00	4.63	4.93
Preferred stocks .	214,137.50	247,225.00	247,325.01	1,993.75	5.02	5.01
	$ 467,137.50	$ 520,501.25	$ 503,732.76	$ 5,593.75	4.81	4.97
Special trust fund:						
Common stock ..	$ 16,371.45	$ 6,549.00	$ 16,371.45			
	$2,338,769.00	$2,480,456.86	$2,445,314.92	$31,612.02	4.80	4.87

INVESTMENTS

Summary of Average Yields for Year

	On basis of	
	Quoted value	Book value
	%	%
Bonds	4.64	4.89
Stocks:		
Preferred	4.72	4.65
Common	6.83	5.65
	4.80	4.87

EXHIBIT IV

Statement of Permanent Funds Showing Changes During the Year Ending December 31, 1934

	Balance January 1, 1934	Additions	Deductions	Balance December 31, 1934
Restricted endowments: ...				
Endowment for science and education	$ 89,115.49			$ 89,115.49
Addison Brown Fund . ..	21,149.31			21,149.31
John Innes Kane Fund	35,347.63			35,347.63
Maria De Witt Jesup Fund	25,000.00			25,000.00
Olivia E. and Caroline Phelps Stokes Fund . ..	5,031.63		$ 1.00	5,030.63
Charles Budd Robinson Fund	755.04			755.04
The H. H. Memorial Fund .	5,000.00			5,000.00
Alexander P. Anderson and Lydia Anderson Fund ..	10,000.00			10,000.00
Students' Research Fund ..	9,522.00	$ 280.00		9,802.00
Endowment for the publication of "Mycologia"	1,000.00			1,000.00
Nathaniel Lord Britton and Elizabeth Gertrude Britton Fund		20,000.00		20,000.00
	$ 201,921.10	$20,280.00	$ 1.00	$ 222,200.10
Unrestricted endowments:				
Endowment Fund	$ 242,726.71		$1,471.42	$ 241,255.29
David Lydig Fund	34,337.86			34,337.86
William R. Sands Fund .	10,000.00			10,000.00
Darius Ogden Mills Fund .	48,099.17			48,099.17
Henry Iden Fund	10,000.00			10,000.00
Fanny Bridgham Fund	30,000.00			30,000.00
Francis Lynde Stetson Fund	25,000.00			25,000,00
Russell Sage and Margaret Olivia Sage Memorial Fund	783,924.21		814.25	783,109.96
Frances Griscom Parsons Fund	2,304.67			2,304.67
Special Endowment Fund ..	519,038.36	$ 5,855.88		524,894.24
The John D. Rockefeller, Jr., Fund	500,000.00	5,964.00		505,964.00
The Charles Patrick Daly and Maria Lydig Daly Fund	19,636.34			19,636.34
The James A. Scrymser and Mary C. Scrymser Fund..	12,750.00			12,750.00
The George N. Best Fund	3,000.00			3,000.00
	$2,240,817.32	$11,819.88	$2,285.67	$2,250,351.53
Special endowment: Special Trust Fund	$ 21,158.82			$ 21,158.82
	$2,463,897.24	$32,099.88	$2,286.67	$2,493,710.45

EXHIBIT V

Special Funds

Statement of Application of Income from Restricted Permanent Funds and Special Funds Designated for Specific Purposes

	Balance January 1, 1934	Additions	Expenditures	Balance December 31, 1934
Restricted permanent funds:				
Endowment for science and education:				
Public lectures and instruction, research and publications other than "Addisonia"	$ 274.62	$ 4,250.93	$ 4,203.74	$ 321.81
Addison Brown Fund:				
Publication of "Addisonia"		2,065.31	1,956.78	108.53
John Innes Kane Fund:				
Plant purchases and expenses	2,876.55	1,687.32	2,103.43	2,460.44
Maria De Witt Jesup Fund:				
Botanical collections and binding of books	91.19	1,193.38	1,183.67	100.90
Olivia E. and Caroline Phelps Stokes Fund:				
Investigation and preservation of native plants	735.52	280.83	327.19	689.16
Charles Budd Robinson Fund:				
Exploration	36.60	36.04	13.19	59.45
The H. H. Memorial Fund:				
Development of model gardens	14.68	241.67	256.35	
Alexander P. Anderson and Lydia Anderson Fund:				
Research	891.19	477.35	900 00	468.54
Students' Research Fund:				
Scholarships and prizes	384.98	454 53	605.50	234.01
Mycologia Fund:				
Publication of "Mycologia"	392.08	3,120.99	2,996.49	516.58
Nathaniel Lord Britton and Elizabeth Gertrude Britton Fund:				
Research, exploration, publication, purchase of plants, books, specimens, etc.		238.67		238.67
	$5,697.41	$14,047.02	$14,546.34	$5,198.09
Special funds contributed for specific purposes:				
Contribution of trustees of Carnegie Corporation:				
For program of public education (*Carried over*)	$ 422.58		$ 422.58	

EXHIBIT V—*Continued*

	Balance January 1, 1934	Additions	Expenditures	Balance December 31, 1934
(*Brought forward*)	$ 422.58		$ 422.58	
Bequest of William Gilman Thompson, designated by executive committee for construction of rock garden	1,577.69	$ 150.00	1,727.69	
Fees from school for gardeners	669.90	969.35	549.81	$1,089.44
Sale of shares in the Southern Appalachian Expedition	524.19		339.11	185.08
Other restricted contributions	208.85	62.00	223.17	47.68
	$3,403.21	$ 1,181.35	$ 3,262.36	$1,322.20
	$9,100.62	$15,228.37	$17,808.70	$6,520.29

SOUTH AFRICAN DISPLAY AWARDED TWO GOLD MEDALS

The exhibit of plants from South Africa, their hybrids and varieties, which The New York Botanical Garden displayed at the International Flower Show this year, was awarded two gold medals, one in a special class from the Flower Show organization itself, and one from the Garden Club of America, as an outstanding contribution to American horticulture.

The keynote of the 1935 show, which took place in Grand Central Palace, New York, March 18–23, was gardens of the South. The New York Botanical Garden carried out this theme by arranging the hundreds of South African plants as though in a southern garden in the United States.

Stone walls were used to support a double terrace, at the back of which were placed specimens of Grumilea, Acokanthera, Crotalaria, *Buddleia salviaefolia,* species of Pelargonium, and a mass planting of *Ursinia anethoides,* with several tall Acacias in full flower at one side.

The lower terrace was occupied by annuals and bulbous plants, many of which can be grown outdoors in the southern and southwestern states, and some of which can be raised, with proper care,

FIGURE 1. Annuals and bulbs in gay array, with succulents on the raised terrace at the end, in the Botanical Garden's Flower Show display of South African plants, their hybrids and varieties.

even in the North. Others are known as attractive greenhouse subjects, and still others as plants which give promise for northern hemisphere use, as soon as they are more widely introduced.

The bulbous plants which excited the most admiring comment were two of the smallest flowers in the whole display—the little rose-purple calla which grows in the grassy plains of the Cape of Good Hope—*Zantedeschia Rehmanni*—and the red, green, and yellow trumpet-tubes of *Lachenalia tricolor* Nelsoni. Among other bulb plants which added their brilliance to the display were many Freesias of varied hues, bright-orange and salmon-pink Tritonias, purple flowers of Sparaxis and Babiana, pink Watsonias, sulphur-yellow Ixias, flame-colored Clivias, pure white Crinums, and large yellow and white Callas.

Among the annuals, those of the daisy group predominated, with such species as the clear-blue *Felicia Bergeriana,* and *Agathea aethiopica,* as well as the deeper blue *Charieis heterophylla,* the blue-white *Dimorphotheca pluvialis*; the showy orange *Venidium fastuosum,* species of Ursinia, including the gay little *U. pygmaea,* and the strikingly marked bedding daisy, *Gazania rigens*; the many hybrids of *Gerbera Jamesonii,* their colors running from soft yellow through soft red, and the lilac-flowered shrub *Aster frutescens.*

Another composite of interest was *Cotula barbata,* whose tiny yellow globes of minute flowers were noticed by many visitors.

Nemesias in blue, salmon, white, and tones of brilliant red and orange made striking spots of color in the layout, while the Heliophilas were a sheet of sky-blue during the first days of the display. The uniquely fringed flowers of the Polygalas shown were a surprise to all those familiar with the native species, for they closely resemble *Polygala paucifolia,* even in their rosy-purplish color, but they grow on leafy shrubs two or more feet high, instead of only a few inches above the ground.

In addition to the annuals and bulbs in the double terrace, at the right was a raised walled garden devoted entirely to South African succulents. Such rarely seen plants as the silver-tree (*Leucadendron argenteum*); *Stangeria paradoxa,* with a rosette of immense leaves, out of the center of which arises a huge gray cone; *Euphorbia Tirucalli* with its sprawling branches resembling green rubber tubes; *Testudinaria elephantipes,* a delicate vine growing out of a large corky tuber which gives it the common name of "elephant's foot" (this was one of the specimens brought from South

FIGURE 2. Strange-looking succulents comprised part of the South African display, *Euphorbia Tirucalli* at the right rear, *Stangeria paradoxa* at the left, and many species of Senecio, Aloe, Gasteria, Mesembryanthemum and other genera proving great curiosities to visitors.

Africa by Mrs. Jerome W. Coombs); and *Haemanthus puniceus,* with two astoundingly long, broad, and leathery basal leaves.

The familiar "twining Bowiea" of greenhouse culture appeared under a botanical name unfamiliar to many—*Schizabasopsis volubilis,* the name adopted by the 1930 Botanical Congress.

Numerous species of Senecio, Euphorbia, Aloe, Crassula, Stapelia, Gasteria, and Mesembryanthemum and its relatives were included in the succulent collection, which also was arranged as it might be in a southern desert type of garden. The smaller specimens planted near the edge were protected by cellophane.

CAROL H. WOODWARD.

THE ANNUAL BORDERS OF 1934

Last year in the beds adjacent to the Conservatory Range 1 the method of planting was completely changed from that of former years, when the beds were occupied principally with herbaceous perennials, supplemented in summer with annuals and biennials to extend and prolong the season of bloom.

It was felt, however, that if a continuous and unbroken display were to be maintained the principal planting would have to be composed of annuals. Accordingly, and with very few exceptions, the beds in this vicinity were planted with annuals selected for their long period of bloom.

The only herbaceous perennials used in the entire scheme were leadwort, sneezeweed, Pitcher's sage, and some delphinium hybrids.

Leadwort (*Ceratostigma plumbaginoides*), which blooms in August and September, is an excellent plant for the edge of the border, growing from six to eight inches high. With its wealth of small blue flowers and shiny green foliage, it has an orderly appearance. The other subjects—the sneezeweed (*Helenium autumnale*) variety *rubrum,* Pitcher's sage (*Salvia Pitcheri*) and the delphinium hybrids—were used because of their adaptability to the design, their time of blooming, and their comparatively long season.

When *Helenium autumnale rubrum* blooms in August and September, it is about three feet tall and is literally covered with dark ruby-red flowers with a raised yellow disk. If the tips are pinched out when the plants are about two feet tall, they will throw out

numerous side-shoots that not only tend to increase the floriferousness but will also extend the season of flowering.

Salvia Pitcheri, which is seen in September and October, has flowers of clean blue, standing about three feet high; it has one bad feature in its weak leggy stems, that rather tax the gardener's art to keep it neatly staked, but its color—coming at a period when blues are scarce—lends a refreshing note to the border when the flowers as a whole are beginning to show the effects of a long dry summer. Only the hybrid delphiniums, which come into bloom in shades of blue about the end of June, accompany it with a more or less continuous supply of flowers throughout the summer and fall.

In planning these beds, great care was taken to be sure that no clashing of color should mar the effect. The keynote of the whole planting was the arrangement of bold groups and masses, here and there allowing them to drift and blend into one another.

Perhaps, one of the most interesting subjects in the design was the use of the scarlet sage (*Salvia splendens*). This is an annual that most people avoid, for its very positive red is difficult to combine with other plants. It was used here in two places in the beds, in both being given the softening effect of an evergreen background. In addition it was accompanied by carefully selected subjects. In one instance it was planted with Dahlia Countess of Lonsdale and faced down with white verbena, and in the other it was planted in combination with sunflowers and heliotrope and faced down with sweet alyssum (*Alyssum maritimum*).

The orthodox way to plant *Salvia splendens* seems to be in a bed on the lawn or perhaps used in conjunction with cannas, but it was proved here that it could be used very effectively in certain situations if planted with other suitable varieties of annuals.

Its counterpart, the mealy-cup sage (*Salvia farinacea*) is an annual of outstanding merit. Its long spikes of blue flowers, clean gray-green foliage, and neat compact growth, coupled with a long season of bloom, enables it readily to adapt itself to any style of planting, and its freedom from insects and disease add to both its utility and beauty.

In all the great range of annuals, there is perhaps none more effective than the old-fashioned annual of grandmother's garden, the zinnia. The work of plant breeders in the past few years has

resulted in greatly improved form and color as well as increased size of flower. In the borders it is particularly good for massing, and its long blooming period and its usefulness as a cut flower are all factors that combine to make it a popular annual. It was used very generously throughout the design at the Garden and more than repaid the confidence placed in it.

The zinnia, despite the fact that it is one of the easiest annuals to grow, has certain cultural requirements which though few are nevertheless essential, if we would maintain it in a thrifty condition and prolong its season of bloom. Toward the middle of a hot summer, the zinnia will tend to become hard and woody, and the flowers to become smaller and smaller until eventually the whole plant will dry up. To offset this and to keep the plants blooming in borders last summer, they were given frequent and copious waterings, the hose being laid down and the water allowed to seep down to the roots. About once a week they were given a light application of nitrate of soda applied when the ground was thoroughly soaked and again washed in with the hose, this being alternated occasionally with light applications of tankage applied in the same way, this treatment being coupled with the constant removal of spent blooms. Thus they were kept in a healthy condition over a long period.

An annual that does not seem to be known as well as it should but which is a very effective subject is the tuber verbena (*Verbena rigida*) or, as it is known in the seedsmen's catalogues, *Verbena venosa.* It grows about one foot to eighteen inches high, in color is a good purple, and is a vigorous grower. It is entirely free from insects and diseases. Because of its form and its long-extended season of bloom, it lends itself readily to massing. In the borders it was used in conjunction with the clear yellow Santa Barbara poppy (*Hunnemannia fumariaefolia*), the two making a striking combination that drew many a favorable comment from visitors. *Verbena rigida,* by the way, is a tender perennial but is used as an annual, as it blooms the first year from seed, started early indoors. This verbena, together with the above-mentioned *H. fumariaefolia,* is an excellent subject for a dry situation. Hunnemannia is a member of the Poppy Family and is rather adverse to being transplanted. It should be either started in pots and then planted out or sown directly outdoors in late May.

FIGURE 1. Zinnias, mealy-cup sage, sweet alyssum, and red nicotianas in part of the border of annuals north of Conservatory Range 1.

The cup-flower (*Nierembergia gracilis*) is another of the lesser known annuals that is very effective. It is of short compact growth with very slender foliage and is covered throughout the season with pale blue flowers. It is an excellent subject for the front of the border or for massing in beds and is not entirely adverse to a dry situation.

The petunias too make a colorful display and continue in bloom throughout the long season. Here again the work of the plant breeder is in evidence in improved types and a greater range of color. Perhaps one of the most outstanding varieties, and one that attracted considerable interest last year is a variety known as Velvety Violet, a very deep shade of purple. It might be thought of as a somber color but used as it was here, in combination with a white zinnia and the little fine-leaved marigold (*Tagetes signata* var. *pumila*), it made an excellent picture. The little fine-leaved marigold is a very dwarf form, with dense fern-like foliage, which during the greater part of the summer is almost hidden under a

wealth of bright yellow flowers. It is very satisfactory for a low spot in the border, for within a short time the plants lose their individuality and merge into a low dense mass.

Another very interesting subject is the Japanese pink (*Dianthus Heddewigii*), variety Black Prince. It is almost black, with a very thin margin of white around the outer edges of the petals, which seems rather to accentuate its dark color. It is really a biennial but, blooming as it does the first year from seed sown about the beginning of March, is used mostly as an annual. It is of very easy culture and is in bloom practically the entire season.

In all the great array of annuals that makes our beds and borders gay and colorful throughout the summer, there is none more dependable or more worthy of a place in our plans than the annual verbena (*Verbena hybrida*). It does, I grant, require a little care at time of seeding and should be started early, say the end of February or the beginning of March. Given these requirements, it will respond with a long season of flowering that extends right up to frost. In a rich soil it will need restraining, as it is a vigorous grower, but this is a point that can rather be taken advantage of, for if planted near a subject such as the China Aster (*Callistephus chinensis*), which does not last the entire season, the Verbena will solve the problem of a bare patch in the border by gradually taking possession of it. Such a prolific bloomer requires that the spent flowers be continually removed, both from the standpoint of tidiness and to preserve the vitality of the plant. A point worth remembering is always to cut the flower stalk also. There is nothing more unsightly than to see bare stalks sticking up among the flowers like so many toothpicks, and this applies to almost every instance where faded flowers are being removed.

This review of the planting of 1934 would hardly be complete without a mention of those other annuals that contributed their quota to making the borders what they were, a continuous carpet of color throughout the season. Some of them are the well-known annuals we see every season, but of which we never tire. We always experience a feeling of pleasure when they begin to bloom, and a feeling of regret when they leave us.

The snapdragons (*Antirrhinum*) with their long spikes of various colors, that give us repeated crops of bloom during the whole season, and the gay marigolds (*Tagetes erecta*), in yellow and

orange, were outstanding. The new introduction called Guinea Gold bids fair to become a garden favorite. Its fine camellia-like flowers, of good form and substance, and its finely cut foliage, maintained in good condition throughout a long season, are factors that recommend it for general culture.

The extensive use of the newer types of sunflower was a feature of the planting that should not be overlooked. A variety called Stella hybrids, obtained from Sutton's of Reading, England, gave much promise. While the larger-flowered forms scarcely fit into a narrow border, they were grown to show the variations in color now being developed. The dignified and sober-looking mourning bride (*Scabiosa atropurpurea*), the bright-blue floss-flower (*Ageratum Houstonianum*), and the large daisy-like cosmos (*Cosmos bipinnatus*) gave a long-extended season of bloom. The colorful little annual phlox (*Phlox Drummondii*) is a worthy subject but it requires frequent watering in a dry season and is one of those annuals that is perhaps best sown outdoors.

The white and ruby colored prickly poppies (*Argemone grandiflora* and *A. platyceras rosea*) are also best sown where they are to bloom. Argemone is a member of the Poppy Family, hence will not withstand transplanting. It is well worthy of a place in the annual border. So also is the periwinkle (*Vinca rosea*), a very tender annual, and the globe flower (*Gomphrena globosa*), which is an everlasting. Both maintain their trim appearance and continue to flower right up to the end of the season.

The use of foliage plants was not overlooked, and several different forms of the amaranthus added many a brilliant spot of color here and there throughout the borders. Besides the well-known species called Joseph's coat (*A. tricolor*) with its varied hues, another species (*A. salicifolius*) made a striking impression, for it has long, undulating, deeply colored foliage. Variegated corn (*Zea japonica*), with its waving tassels and white striped leaves, produced a decidedly tropical aspect.

Among our annual gems the blue *Torenia Fournieri* must be given a prominent place. One wonders why it is not more used, as it is of easy culture and blooms profusely, growing about one foot high. While it is a tender annual, fairly good results can be obtained by sowing outdoors in warm weather. It likes a sunny position and good, well-drained soil.

The extensive use of *Lantana Camara,* both the orange and the cream varieties, and *Lantana Sellowiana,* the purple creeping variety, was also a new and interesting feature of last year's planting. These two species of Lantana are really greenhouse perennials, and plants for the outdoors are raised each year from cuttings taken in February and March. An old-time favorite, it is still hard to surpass as a bedding plant, and given the few cultural requirements it needs, which are a good soil, a sunny situation, and sufficient moisture during the hot season, Lantana will respond with a wealth of color that is still fresh when other subjects have passed on.

A word concerning the method of staking which was used last year might not be amiss at this juncture. Whenever it was possible to do so, stakes and strings were omitted and twiggy brush was used. The best kind seems to be that cut from wild cherry trees. This was cut in various lengths and inserted among the plants and in every respect it proved superior to stakes and strings. It is particularly useful among plants of dense foliage and thin stems, for not only does it support them naturally, but it tends better to keep the plants open, admitting air and sunshine—two very vital elements in maintaining their vigor. Another point in favor of brush is that it is not unsightly, for the plants growing up around it completely hide it from view.

Now it can readily be seen that the success that attended this scheme of planting of 1934 was due, not to chance methods or to merely trusting to luck, but rather to observance of certain principles, for we should not lose sight of the fact that any scheme of planting, whether simple or elaborate, whether it be designing of borders or massing in beds, depends for its success upon certain fundamentals. It depends, first of all, upon a knowledge of the plants we are working with, of their different characteristics, and how well they fit into the scheme we have in mind. It depends, too, not only on a knowledge of sane cultural practices based on the plant's requirements, but on their application, and again it depends on sound planning and attention to detail.

With recognition and application of these fundamentals, we have gone a long way, not only to eliminate the element of chance, but, what is more important, to insure to a very great degree the success of our display.

PATRICK J. MCKENNA.

III

PROBLEMS IN THE STUDY OF THE PATELLARIACEAE[1]

The Patellariaceae are a little-known family of the inoperculate Discomycetes, placed by most mycologists in the Pezizales. This family is characterized by its small, disc-shaped, black, subcarbonaceous and superficial apothecia, and by the presence of an epithecium formed from the enlarged colored tips of the paraphyses which extend above the asci.

A close relationship between the Patellariaceae and the lichens, especially the group Cyclocarpineae, has long been recognized. A careful study of the Patellariaceae has shown a closer relationship to the Cyclocarpineae than to the Pezizales. Many genera of the Patellariaceae are lichens—in the new sense of that term, according to Bruce Fink's definition: "A lichen is a fungus which lives during all or part of its life in parasitic relation with an algal host and also sustains a relation with an organic or an inorganic substratum." In the new classification of the Ascomycetes, which includes also the lichens, the Patellariaceae should be placed in the order Lecanorales, with the Cyclocarpineae. There are definite distinguishing characters separating the Pezizales and Lecanorales. Many genera of the Patellariaceae can not be distinguished from the corresponding genera in the Lecideaceae and are being combined with them. Further details of this work will appear soon in a thesis. This work is seriously hampered by a lack of fresh material for study in culture. The writer would greatly appreciate information of any recent collections that might be available for study.

ELLYS BUTLER MOLDENKE.

NOTES, NEWS, AND COMMENT

Dr. E. D. Merrill, Director, visited the Atkins Institute of the Arnold Arboretum in Cienfuegos, Cuba, the latter part of March.

Miss Carol H. Woodward left March 29 for Europe, where she plans to attend the International Flower Show in Holland, the Chelsea Show in England, and to visit gardens and botanical insti-

[1] Abstract of a report at a Conference of the Scientific Staff and Registered Students of the Garden in February, 1935.

tutions in several countries on the continent, concluding the trip at the International Botanical Congress in Amsterdam in September.

At the second annual meeting of the Florida Botanical Garden and Arboretum Association recently held at Sebring, Dr. A. J. Grout, of Newfane, Vermont, and Manatee, Florida, was unanimously elected President of the Board of Trustees. Dr. Grout, who spends considerable time in the library and herbarium of The New York Botanical Garden in spring and autumn, is widely known to the botanical public through his popular books and more technical papers on the mosses. He has rather recently retired after many years of service as first assistant in the Boys' High School of Brooklyn and the Curtis High School of Staten Island.

The following visiting botanists registered in the library during the winter: Dr. Ernest J. Schreiner, Frye, Me.; Dr. Grant D. Darker, Cambridge, Mass.; Miss Carrolle E. Anderson, Amherst, Mass.; Dr. and Mrs. A. L. Winton, Wilton, Conn.; Dr. J. E. Spingarn, Amenia, N. Y.; Dr. R. T. Clausen, Ithaca, N. Y.; Dr. John M. Fogg, Jr., Dr. W. M. Benner and Dr. Edgar T. Wherry, Philadelphia, Pa.; Mr. F. A. Varrelman and Mr. Egbert H. Walker, Washington, D. C.; Dr. David D. Keck, Stanford University, Cal.; Mr. Harold T. Stearns, Spreckelsville, Hawaii; Mr. Ray J. Baker, Honolulu, Hawaii; Dr. Mel T. Cook, Rio Piedras, Porto Rico; and Dr. A. L. Hacquaert, Ghent, Belgium.

Doctor W. H. Camp spoke on "Floral Anatomy and Sex-Reversal in Hemp (*Cannabis sativa*)" at the regular monthly conference of the Scientific Staff and Registered Students of the Garden, March 14.

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JOURNAL OF THE NEW YORK BOTANICAL GARDEN

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JOURNAL
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RAISING HARDY PLANTS FROM SEED[1]

Who is there wanting to do gardening who has not a keen desire to sow seeds? For only by sowing and tending the plants ourselves shall we ever know anything of the thrills, the joys, and the disappointments that await us in watching these little fellows grow up. Experience has to be our main guide toward success.

If we are beginners, we may order, for instance, pansy, *Campanula Medium,* and *Heuchera sanguinea* from the perennial list in the seed catalogue, and sow them all together around the first of June. The Campanula and Heuchera may grow into fine plants, ready to set out in flowering quarters by the first of October. The pansy too will have grown, but by fall it will have exhausted itself and may die with the first winter weather, reducing itself thereby to an annual.

But if we sow these three plants when the pansy ought to be sown—around the first of August—the pansy will do well for us the following spring, but will be exhausted with the torrid days of summer, thus becoming a biennial.

The August sowing of *Campanula Medium* will give so small a plant for setting out that at best we can get only a small spike of flowers the following June before its demise—for the Canterbury bell is a staunch biennial, and takes considerably longer from seeding to flowering than does the pansy.

The Heuchera, we notice, has done well from both sowings. It is slower, perhaps, than the other plants, but it shows itself truly

[1] Abstract of a talk given at The New York Botanical Garden by Mr. James Esson, Superintendent of Mrs. Roswell Eldridge's estate at Great Neck, Long Island.

a hardy perennial and proves that, with plants of this type, the time for sowing ultimately matters little.

I feature these three plants to show how important it is to know when to sow many so-called perennials. Many other perennials which are popular in our gardens, such as *Anchusa, Geum, Coreopsis, Gaillardia,* foxglove, and hollyhock, have a bad habit of becoming poor specimens or even dying after flowering. These therefore do better when treated as biennials, with annual sowings in June.

It is such little idiosyncracies of plants that make this simple work alluring.

When to sow seeds of hardy plants can be governed by no hard and fast rule. All ought to be treated as individuals in order to attain the very best results. So much depends on what is to be raised; so much on facilities available; so much upon our knowledge of the behavior or requirements of the particular plant in hand. In this connection, I have invariably noticed that with *Campanula Medium* a much better germination always results from sowing in a frame with a northern exposure in a spot where the environment is always cooler than in the rest of the garden. This is a plant that at no stage appreciates Fourth of July conditions.

It is very nearly safe to say that with the majority of plants the seed should be sown as soon as it can be procured after ripening. "From the capsule to the soil" might well be the hardy plant propagator's slogan. It is true that springtime is considered seeding time, and this is true with most plants we grow, but the answer to that might well be, that most plants we grow are not natives of our region. Furthermore, by immediate or fall sowing a whole year is saved in our attempts with many hardy plants.

I do not think that seeds require a resting period after ripening, as has often been said. No doubt when the temperature has dropped below the growing degree for any particular species, growth stops and the seed may be said to be at rest. Again, if seed is in a packet in your seed cupboard, where it receives no moisture at all, it may be said to be at rest. But if seed of a hardy plant that has a hard shell, which takes a long season to soften sufficiently for the embryo to commence growth, be immediately sown, this outer shell, with freezing and continuous soaking out of doors, will at last be slowly decayed, so that growth will commence readily when

the temperature is high enough. This growth can, in many instances, be hastened by use of a greenhouse. I refer chiefly at this stage to hard-seeded plants, such as hollies, viburnums, *Crataegus,* and many of the Rose Family. Some of these require two winters of exposure before they germinate. To get the pulp or berry part away from the seed of fruits like the holly and the thorn, a good plan is to put them through a meat chopper twice. It is surprising how the pulp can be cleared away without damaging the seed.

Unlike the thorn, we have many seeds that lose germinating power or vitality very quickly. The larkspur, elm, pansy, and oak are common examples. Elm and oak seed will be lost if not sown soon after harvesting. The larkspur and pansy become weaker every month that they are kept dry. Perhaps the vitality depends upon the chemical constitution of the seed and the gardener cannot always tell what is an oily seed, which of course would be the most perishable; or what is a starchy seed, which would be the more tenacious of life.

All seeds of hardy plants, that is, alpines, hardy herbaceous perennials, shrubs, and trees that are to be raised in small quantities, or that must of necessity be handled at irregular intervals, should be sown as soon in summer as they can be procured. Many will germinate quickly; others more slowly; if they are native of a cool latitude or high altitude, they should have the snow reach them, or be frozen and covered with salt hay. In early spring, they can be brought to the greenhouse, where there is a minimum night temperature of 50°. In the greenhouse they must be kept closely shaded and the surroundings as moist as possible, so that there is the least possible chance of the soil drying. It will be necessary to moisten overhead at times by using a big fine nose on the watering pot. Seeds given this winter treatment quickly germinate when brought into the greenhouse. All that fail to germinate by this treatment can well be kept another year, but after that I think it is useless to preserve them further.

With a greenhouse for raising our seedlings, Delphinium can be made to blossom from June throughout the whole summer, even up to Thanksgiving in some seasons. Sown in February or early March, delphiniums will germinate in a very few days, and if pricked off and kept in a growing temperature, they make sizable plants for setting in flowering quarters by May. From August on,

they will supply good spikes for cutting. A June sowing makes plants to put out in September which will flower the following June.

Iris is handled slightly differently. Fresh seed may be sown as soon after ripening as possible. Many will germinate that same year. Sometimes it will be spring before they come up. If by that time they have not appeared and we are certain no cultural defects can be pointed to, it is almost certain the seed has been defective.

Raising lilies from seed is one of the most interesting pursuits I know of in the whole field of propagation. Most varieties of lilies sown in a cold frame in October, in a soil mixture that has a high percentage of leaf-mold or peat, will germinate the following spring. Indeed, if seed of *Lilium regale* and some of the earlier sorts can be obtained sooner, it is wise to sow immediately. Some of them germinate very quickly and if they can be pricked into a frame early enough to be established before cold weather sets in, they are so much ahead. When saving seeds of a particular species it is desirable to have several plants growing side by side to insure cross-pollination.

To be successful with even the more usual flowers of which we get large packets, I prefer to use a frame as a seed-bed enclosure, to any position in the out-of-doors. The frame has many advantages. Shading material can easily be thrown over it. Drying up of the seed-bed will be much slower. Unskilled labor has more respect for things growing in your frame. There will also be opportunity to give quick-growing, deep-rooting subjects a chance to get ahead, since the seed-bed will be deeper than a flat or a pot. If sown thinly, the young plants can be left longer, especially if the seed-bed has been well prepared. It should be moderately rich in humus. Fertilizer or other manure should be avoided, but a goodly proportion of decayed oak or beech leaves incorporated in the soil will be a benefit to the seedlings as soon as they germinate.

It is important that the whole bed, which should be at least one foot deep, be moderately dry when prepared—dry enough not to cake when consolidated. That is, after gripping a handful, it should fall to pieces but leave your finger marks. In preparing, break up all lumps consolidated by treading over, and with a rake finish off a nice level surface. Seeds may be broadcast or sown in drills. I prefer drills, especially when several of the same genus

are being sown alongside one another. Thus each kind can better be kept separated. The depth at which the seeds are covered is very important. It is well to keep in mind that we are *sowing* seeds, or, if you like, call it scattering seeds and not burying them. An old rule is to cover to the depth of the seed you are dealing with, and I would say very often, cover even less. The important thing is, water them well with a fine nose on the can, and shade constantly until germinated. Avoid as far as possible airy, drying conditions. All this frame sowing applies in the main to quick-germinating material that has been handled often in quantity and that is invariably offered in seed catalogues.

When we come to choicer things—to *Primula,* to *Ramondia,* to seeds of hard-wooded plants, and to new things, the better way is to sow in pots—flats if you will, but I prefer pots. A five-inch pot is the smallest I would use. Smaller ones take up less room, but they have a tendency to dry out too quickly. Ample drainage should be used, and the soil should consist of a mixture of equal parts of loamy soil, leaf-mold or peat, and grit or sharp sand. In the case of the Ericaceae, which includes *Rhododendron, Daboecia,* and that delightful plant, the trailing arbutus—if you can grow it—peat and sand should be the medium. Fill the pots to within half an inch of the top. The top layer should be put through a very fine sieve. Press the whole down and water to saturation. If the middle of this surface is slightly raised it will impede drying out at the sides of the pot. After the actual water and muddy condition have gone, the seeds should be sown thinly. The depth to cover is as important here as in the frame. Before sowing very minute seeds, it is advisable to mix them with a pinch of dry sand so that a more uniform spread will be obtained. These last should receive no covering at all. After sowing, the pots should be removed to a frame, stood close together, and covered with heavy brown paper. Over this may be added a four-inch covering of moist sphagnum moss, or anything that will assist your efforts in maintaining an evenly moist condition.

Little watering will be necessary for some time. Examine every few days, until some of them begin to germinate, when more constant daily watchfulness will be essential. As every species germinates it must be removed to where light and air can be admitted. Close proximity to the glass is important, otherwise weak growth

will result. It will be found that from this point they will require more water and that must be determined according to the time of year.

There will be some, perhaps many, that have not germinated, and those will probably be the kinds that require freezing. The first transplanting of these is rather important, and as soon as they can be handled easily, or perhaps I should say as soon as the second leaf appears, it will be better to transplant, or prick them off. In the dull months this move is very important for those that have been frozen and brought into a greenhouse in early spring. It will invariably prevent damping-off.

Transplanting should be done in as high a temperature as that in which the seeds have germinated. The soil should be similar to the seeding soil, except that it need not be quite so fine, and a little lime can be added with advantage to subjects we know are lime-lovers.

In pricking off, use a fine-pointed, hardwood dibble. The beginner should be cautioned not to press the soil to the neck or stem of the tiny plant, but to the roots. These seedlings, if alpines or herbaceous perennials, should be spaced widely enough to allow them to grow sufficiently large to go into their flowering quarters when next moved. Most shrubs and trees can be left in the seed-pan until growth commences outdoors in spring. They may then be planted in nursery rows and watered thoroughly.

JAMES ESSON.

THE PENCIL-CACTUS (RHIPSALIS) IN FLORIDA AND AT THE GARDEN

On August fifth, 1923, the genus *Rhipsalis* was first collected in Florida. This also was the first time it had ever been found at a point north of the Tropic of Cancer. Two associates of the undersigned, Charles A. Mosier and John B. DeWinkeler, discovered it high up on tall live-oak trees. They managed to dislodge a large plant and sent it intact to the Garden by express. Upon arrival at the Garden the base of the plant with its roots was attached to the bark of a section of a freshly cut oak tree (though not a live-oak) in order to make the plant feel at home. The exhibit was placed in the cactus house in Conservatory Range 2, and allowed to grow.

A plant of the leafless pencil-cactus—*Rhipsalis Cassutha*—from southern Florida. While growing at the Garden, it bore flowers and fruits throughout the year. Numbers of them may be seen on the stems.

The plant thrived and promptly sent out numerous branches, began to flower, and then to fruit, and persisted in flowering and fruiting continuously for seven or eight years, when it was destroyed for lack of room. A photograph secured in the midst of its career is here reproduced as a record. The flowers, about the size of a head of a good-sized pin, have a white perianth; the white translucent fruits are about as large as a small pea. The old stems are gray, while the new growth is bright green, the branches frequently growing in whorled clusters. This plant is also known as the mistletoe-cactus.

JOHN K. SMALL.

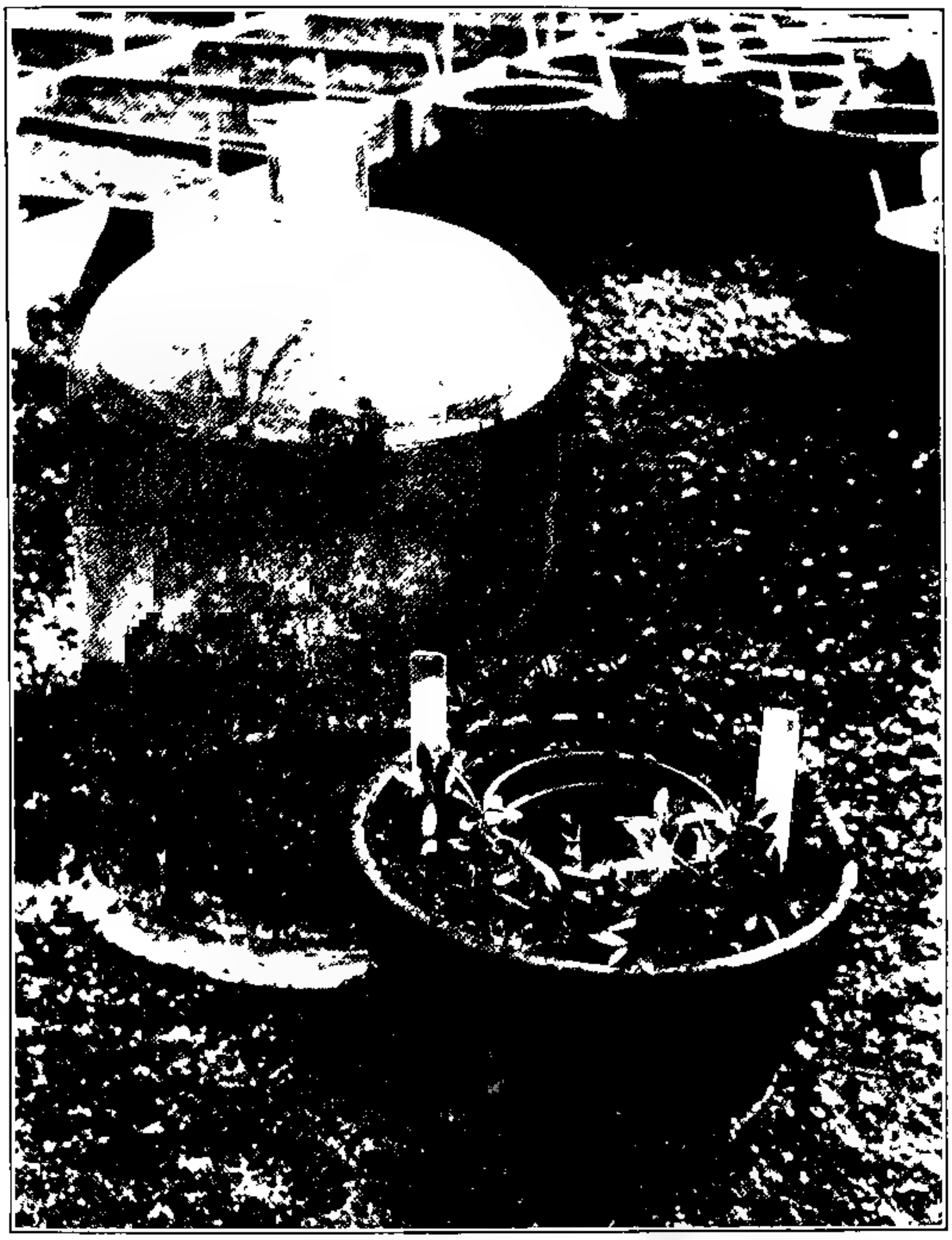
A SIMPLE AID IN PROPAGATION

The simple device, shown here, is not a new invention. Gardeners have known and employed it for generations, but the amateur, to whose efforts it may become a valuable aid, is seldom familiar with it.

At the 1934 New York Flower Show, where the bellglass treatment of cuttings was included in an exhibit of methods of propagation, prepared by The New York Botanical Garden for the Federated Garden Clubs of New York State, it aroused considerable interest. The arrangement consists of a seedpan (6 inches in diameter) with a smaller pot (2½ inches in diameter) inserted in the center. The drainage hole of the center pot is closed with a cork so that it holds water. The drainage hole of the seedpan, however, must be kept open and covered with pieces of crocks in the usual manner.

The space between the two pots contains the rooting medium, sand and peat in equal parts, surfaced with a half inch of washed sand, in which the cuttings are inserted close to the rim of the inner pot. The inner pot has to be kept filled with water, which slowly seeps through the pores of the pot, keeping the rooting medium evenly moist. No direct watering of the cuttings is necessary.

A bellglass, large enough to go over the seed pan and to rest firmly on the ground, is then put over the whole thing. This



A simple mode of propagation

serves to prevent wilting of the cuttings by maintaining a high and very even moisture content of the air which is confined within.

After the cuttings have formed callus, it is advisable, on warm days, to permit a change of air by lifting the bellglass slightly from the bottom, keeping a small block of wood underneath the rim for several hours. The progress in the root development of the cuttings can easily be watched by taking out the center pot from time to time with a twisting movement which prevents disturbance of the soil. In a room the bellglass would, naturally, find its place near a window, but on bright days one must not neglect to protect

it with newspaper against direct sunshine, which would heat it too much and might even cause burning of the foliage of the cuttings.

The uses of this bellglass arrangement are manifold, but it will be found particularly effective for the rooting of all kinds of so-called "soft wood" or "green" summer cuttings, which are most difficult for the amateur to handle without a greenhouse. Also, cuttings of Pelargoniums, Fuchsias, Poinsettias, Begonias, etc., or of various conifers like *Taxus, Thuja,* and *Chamaecyparis,* as well as of other evergreens, such as *Ilex crenata,* Boxwood, Heather, etc., are easy to root in this manner during the winter months.

Certain fine seeds, like those of *Rhododendron* and other ericaceous plants, which are so troublesome because they must be kept evenly moist yet are so easily washed to one side if watered with the sprinkling can, may be raised without difficulty in a pan with a water-filled pot in the center, all covered by a bellglass.

The same method may be applied to the seeds of certain choice alpine plants which require moraine treatment, except that with them half of the space between the two pots must be filled with cinders or potsherds for drainage, and the rooting medium should consist of fine sand, peat, and crushed cinders (or crushed brick) in equal parts. Lime may be added for those that require it.

The New York Botanical Garden succeeded in rooting, with the help of this bellglass arrangement, about 75 percent of cuttings of *Daphne Genkwa* and of several varieties of the Ghent Azaleas which are so rare in our gardens because most growers consider them too difficult to propagate. Cuttings from a tree of a rare variety of ash, which was fatally injured late in the spring by a truck which ran into it, also were raised successfully in this manner.

HENRY TEUSCHER.

SAXIFRAGA TENNESSEENSIS

The expedition into the Southern Appalachian Mountains sponsored by The New York Botanical Garden in 1933 brought back several plants which have proved of value in the rock garden. Not the least interesting of these is *Saxifraga tennesseensis,* a species which had previously been recorded only from bluffs on the Ten-

Saxifraga tennesseensis

nessee River near Knoxville. Our plants were found on limestone cliffs along the Nolichucky River close to Irwin, Tennessee, and thus represent a new locality for this species.

The plants at the time of their discovery had formed their winter rosette and a satisfactory determination was not possible in that condition. As a matter of fact at the time they closely resembled the much commoner *S. virginiensis* and this at first we thought them to be. Mr. Alexander, however, was not entirely satisfied that the plants really were that species and remarked that they "just didn't look right" and so dug a few, which were shipped to the Garden.

These were wintered in a cold-frame and three of the five flowered during the spring of 1934. They were then transferred to the Thompson Memorial Rock Garden and the picture shows one in bloom there. After flowering they continued to make good growth and with a slight covering of salt hay came through the past winter perfectly. At the time of writing (late April) a fat flower bud nestles in the center of each rosette and these soon will expand as graceful sprays of white flowers.

Saxifraga tennesseensis in bloom is a much finer plant than is *S. virginiensis*; the inflorescence is more loosely and slenderly branched, with the individual flowers better disposed, and each flower is flat and star-like rather than campanulate as in the commoner species.

The cultivation of this Saxifraga apparently presents no difficulties and it is thriving here in an ordinary well-drained rock garden soil. From our plants we hope to collect sufficient seed this season to distribute a portion to each subscriber to the Southern Appalachian Expedition.

T. H. Everett.

OUR VANISHING BIRDS

The grounds of the Botanical Garden are the only place left, within the city limits, and for several miles beyond, where our resident and migratory birds can be found in quantity. One small section of Central Park still enjoys the spring and fall visits of certain warblers, of the veery and woodthrush, the common sparrows and occasional rarer species, but only for very brief stops, and each year in decreasing numbers. With the expansion and overlapping of the suburbs immediately north of New York few stretches of countryside remain, certainly no single one that includes such diversified topography and vegetation as we have in the Garden. The north meadow provides the nesting conditions or food required for inland marsh birds and water fowl. Beyond Boulder Bridge are the tangles of elder and willow and catbrier beloved by cardinals, meadowlarks, catbirds, yellow-throats, and others. The slopes to the east are frequented by tanagers and grosbeaks and orioles. The

long stretch of deciduous woods to the south can shelter all the hosts of northern songbirds, and bob-whites, and flycatchers, and the ground-loving ovenbird and chewink. The hemlock ridges are cool enough for veery and hermit-thrush, the trees here tall enough for pine warblers and warbling vireos, the muddy hollows near the stream shaded enough for water-thrushes. There are open lawns for robin and bluebird, and shrubby coverts for sparrow and thrasher. We have every feature to constitute an ideal natural sanctuary—and such the Garden has been for many years.

The birds are beginning to forsake us. Probably many of them have ceased to visit the park altogether. The cardinal is a rarity now, the kingbird is not often seen, not even the ingratiating and friendly chickadee. One seldom encounters a bob-white, although in the tiny strips of woods farther west below Yonkers, one may see them rearing large broods. Mr. Robert S. Williams, who has long kept records of bird life in the Garden, reports that the red-headed woodpecker, the meadow lark, orchard-oriole, bobolink, chewink, indigo bird, bluebird, and chat no longer breed in the park.

People have said that this is due to a decreasing supply of natural food. Many birds, of course, depend, or at least make a large part of their diet, upon the fruit of vines and shrubs and low-growing trees. Weed seed in the meadow was formerly far more plentiful than now, yet flocks of juncos and tree sparrows continue to favor us with long visits each winter. In the hemlock grove the Virginia creeper grows now only on the vertical rock faces and in a few out-of-the-way crevices, but the scarcity of its blue berries has not kept the various thrushes away. The mountain ash is much less abundant than it was: orioles, who are especially fond of the clustered fruit, still pause for days on their way to the rich jungles of the South; and cedar waxwings, who also are partial to it, are with us, in their erratic way, from year to year. However, as the supply of certain wild food plants has diminished, the numerous plantations of berry-bearing cultivated shrubs have increased and matured. Many sparrows and thrushes eat the fruit of the Japanese Yew, of which there are several large groups in the herbaceous garden. There is an abundance of viburnums and mulberries. Surely the destruction of native seed and berry-bearing plants is not the main cause.

As one walks through any of the wooded parts of the grounds

today, he is dismayed at the great number of narrow intersecting paths and open worn spaces that have become established everywhere. The underbrush is rapidly disappearing. There is no safe place for a ground bird to nest. The bird watchers move through quietly and slowly, but the paths have been made by others, whose reasons for coming at all are difficult to know, and who too often have no intention but mischief. Last spring before the leaves were out, I found a mallard sitting on her nest, not more than two feet from a well-traveled path. So perfectly were bird and nest blended with the leaf-strewn ground that many persons must have passed by unaware; and yet, as I discovered later, some boys did find the nest, and, even in spite of the interested protection of one of the wardens, eventually drove the bird away before her eggs were hatched, and destroyed the nest. Boys are not the only offenders. Girls and adults are continually breaking branches and uprooting the low plants. All of the privileges of the park are abused. This must be an old complaint. If nothing is done to check these vandals, there will be no underbrush left in the woods, and fewer and fewer birds. The oven-bird and chewink, two of the most common ground-birds in the New York region, are noticeably scarcer than they were.

The proposed wild flower and bird sanctuary in a part of the wood deserves all possible support. It is ironic and sad that the entire Garden cannot be adequately policed, and some means and authority established for maintaining it in proper condition. Why not a section or two fenced off altogether and allowed to grow wild? Why not at least a few signs requesting the co-operation of visitors and restricting the chosen breeding ground of birds in their season? The assistance of public and parochial schools and of local newspapers has been solicited. But there are individuals who remain unimpressed by any appeal.

Meanwhile May is with us. For many persons in this ugly modern city the Garden, and particularly because of its native plants and birds, has become a reassurance, a tie with a cleaner world outside. Every morning they can be seen stealthily moving about in the northern woods, watching and waiting, or gathering at the bridge to compare notes. No unusual species have been reported; in spite of a cold April the warblers are returning on schedule time.

D. T. WALDEN.

THE FIVE-YEAR PROJECT OF THE GARDEN CLUB OF AMERICA

An impressive evidence of the extent of popular interest in gardening is the announcement of Five-Year Study Projects proposed by the Horticultural Committee of the Garden Club of America. A detailed program has been published, using the genus Hemerocallis as a type, for a complete study of any single group of perennials, particularly in reference to practical cultivation, with the purpose of assembling data from all parts of the country and ascertaining the horticultural requirements and regional adaptability of varieties.

The selection of the daylily is perhaps indicative of the special activity and attention which has centered upon this particular genus in recent years, an activity in which Dr. A. B. Stout of the Garden has been the prime mover and to which he has contributed the remarkable results of his hybridization work. The choice is a happy one because the species of Hemerocallis are relatively few, and this limitation will obviously simplify the study and enable those participating to do a more thorough job. It has been suggested that if larger genera, such as Campanula or Primula, are to be studied it would be wiser to consider only a subdivision of the group.

The plan begins with a preliminary examination of available literature, and for this purpose Dr. Stout's book *The Daylilies* and Circular 42 of the U. S. Dept. of Agriculture are recommended. The first year's work naturally covers the organization of methods, systems of recording, inspection of nurseries and gardens, selection of stock, planting in the spring and again in the late summer for early-flowering varieties, and intensive culture. The second year is devoted in part to promoting interest in the work, with the aim of inducing more individuals to take up the fun, to the increased opportunities and profit of all. At the end of this period a more scientific study of the plant would be desirable, preferably with the advice of a professional. The third and fourth years' work brings in the comparison of reports, and display of specimens. Here, too, the aesthetic possibilities of the flower might be discussed, in reference to flower arrangement and garden design. In the final year it is suggested that local festivals be held and the conclusions published as a permanent record.

It is to be hoped that the plan will meet with enthusiastic response throughout the country. If even only a few members of each group undertook the experiment, a really valuable body of information should be obtained. Surely no type of garden club work could be more appropriate or more worth while. It is through such programs that the Garden Club of America is becoming a highly important organization in the development of our national horticulture. Full details of the Five-Year Plan are published in the *Bulletin* of the Garden Club of America for March.

BRIEF REVIEWS OF SOME WORTH-WHILE BOOKS

Spring seems to be as important a season to publishers as it is among all those people who admire and cultivate gardens.

Before the first shoots of the snowdrops have penetrated the thawing soil, books of interest to garden-lovers and of consequence to real gardeners begin to appear, tempting workers and students and readers alike.

Of prime importance is the recent publishing of a new edition of the indispensable "Hortus." Among other new books which have already been acquired by the library of The New York Botanical Garden, where they are available for reference, are numerous readable volumes on phases of horticulture, nature study, and related subjects. A few of the new books are given brief reviews in the following paragraphs:

"Hortus"[1]

For the identification of plants under cultivation in North America, coupled with brief but comprehensive directions for culture and for the treatment of essential gardening tasks, every serious gardener knows that no other book is quite so valuable as "Hortus" as a general guide. One point always in its favor is its utter reliability. Now, in accordance with a hope expressed in the introduction to the first edition (1930), "a recognized continuing effort . . . to keep account of the cultivated flora" is being carried out. In these

[1]Bailey, L. H., and Bailey, Ethel Zoe, Hortus, A Concise Dictionary of Gardening and General Horticulture. 755 pages; 16 plates. The Macmillan Company, New York, new revised edition with supplement, 1935. $5.

few intervening years, Dr. Bailey and his daughter have found 203 new genera and 2,893 new specific names of plants "introduced into cultivation in North America outside botanic gardens . . or that have acquired public interest as botanical subjects." In the preface to the 100-page supplement, which lists these new plants and describes them briefly, a challenging statement from the first edition is repeated: "The Editors feel that a clear responsibility rests on plant lovers and horticulturists to communicate records of plants in cultivation in their respective regions; there is no other way by which the territory and the subject can be satisfactorily covered."

"What Happens in My Garden"[2]

For the gardener who likes to read pleasant paragraphs about his hobby, with them imbibing the wisdom of a gardener of long experience, Louise Beebe Wilder's latest book will meet his purpose admirably. As in previous works, Mrs. Wilder writes intimately about her own plot of ground and the plants she is raising there, giving in all an entrancing picture of what a home garden—especially a rock garden—may be.

Mrs. Wilder gathers plants and information all over the world; she handles her material with obvious wisdom, and writes about it with relish. Four or five hundred plants are mentioned in this newest book, with notes about her own experiences with them. The titles of half a dozen of the 28 chapters give a fair idea of the content of the book: "The Celandine, a Flower of the Poets"; 'A Word for Early Tulips"; "Flaxflowers"; "Beauty in Onions"; "Hollyhock Cousins"; "Sages of Sorts"; "Autumn Aids for Perennial Borders."

"Old Roses"[3]

During the last five years, during her seasonal commutations between Great Neck, Long Island, and Calvert County, Maryland, Mrs. Keays has been investigating, studying, collecting, and propagating "old roses." Readers of the *American Rose Magazine* and *Annual* have become well aware of the research in the lost roses of

[2] Wilder, Louise Beebe, What Happens in My Garden. 257 pages; 18 plates. The Macmillan Company, New York, 1935. $3.

[3] Keays, Mrs. Frederick Love (Ethelyn Emery Keays), Old Roses. 222 pages; 56 illustrations. The Macmillan Company, New York, 1935. $3.

generations past into which she has projected herself, to the lasting benefit of all lovers of garden roses. Horticultural history and much personal experience, long hours of study, and many miles of journeying have gone into this book, which is written with such enthusiasm for the subject that the words fairly tumble over each other. The reader emerges murmuring the names which were heard only long ago, if ever, and picturing old homesteads abundantly blooming with sweet-scented roses which grew without care, were unaffected by disease, and increased year after year. The movement now on foot to restore the roses which, as the hybridizer's art developed, were forgotten or abandoned, must receive great impetus from Mrs. Keays's book. Appropriately, she closes it with chapters on rose books and uses for old roses.

"Mexican Plants for American Gardens"[4]

Four hundred species of plants are described in this pioneer work of its type on the plants of Mexico, the aim of which is to make gardeners in the United States more interested in the horticultural possibilities of the Mexican flora. Bulbs, vines, and cacti, and wildflowers of many sorts are mentioned, some of the former having been introduced by early settlers, most of the others, however, being native. Mrs. Matschat, who for most of seven years has traveled through Mexico and other semi-tropic and tropic regions, has attempted to note the habitat of each plant which she describes, in order to make its adoption by gardeners further north more certain of success. Many of the subjects, of course, can be grown only in our own far south and southwest, or else in greenhouses in more northerly states. Others, however, can at least be used as pot plants outdoors in summer; or perhaps as interesting new house plants all year around. And some, no doubt, like our now indispensable zinnias, marigolds, dahlias, cosmos, and such, will become striking additions to northern gardens in general.

Scenic descriptions accompany many references to specific plants, while a glance at the gardening history of Mexico furnishes a background, and gives ideas for adaptation of Mexican garden architecture in places outside of the country where it is characteristic.

Carol H. Woodward.

[4] Matschat, Cecile Hulse, Mexican Plants for American Gardens. 268 pages; illustrated. Houghton, Mifflin Company, Boston and New York, 1935. $3.50.

JAPANESE CHERRY[5]

This charming little volume is the third in a series printed in Japan and designed primarily for the instruction of tourists and students. It contains much information and is critically written, avoiding any hint of propaganda. The origin and distribution of the native cherries is explained; the cultivation of domestic sorts and development of named varieties is discussed in detail, and the principal cherry gardens and natural groves are described, giving something of the historical or sentimental associations of each. A chapter is devoted to famous specimen trees, some of which are of giant size and great age, and are protected by law; and the book closes with information regarding the cherry-viewing parties, with a calendar and map, and warnings as to when and where to avoid the crowds. To one familiar with the western classification of species the Japanese system will be rather confusing; but the intention of the book, to give a sound and suggestive popular account, is amply satisfied.

D. T. W.

NOTES, NEWS, AND COMMENTS

Dr. Harold N. Moldenke, Assistant Curator, has just been awarded a National Research Council Fellowship in the Biological Sciences for foreign study. This fellowship is for the period of one year. Dr. and Mrs. Moldenke expect to sail on or soon after October 1, 1935, and will make their headquarters at the Royal Botanic Gardens, Kew, where Dr. Moldenke will continue his monographic studies of the New World *Verbenaceae*.

A "Who's Who in American Plant and Animal Life" is being assembled by the U. S. Dept. of Agriculture. This will be a catalogue of plant and animal germ plasm proved superior for such important characteristics as productivity, resistance to disease and ability to transmit desirable traits. Secretary Wallace believes that as a result of the undertaking improved methods of research will be suggested and as yet unrealized possibilities of breeding brought about. Detailed genetic information is being gathered from all sections and from abroad. A mass of data has already been obtained.

[5] Miyashi, Dr. Manabu, Sakura (Japanese Cherry). 70 pp., numerous photos, paper sides. Bruce Humphries, Boston, 1935. $.75.

The first analysis and deductions will appear in the 1936 Yearbook of the Department.

Federal regulations governing the entry into the United States of Narcissus bulbs from foreign countries will be liberalized December 15, 1936. Under quarantine acts of 1923 and 1926 the importation and domestic distribution of Narcissus was severely restricted, to prevent the spread of three pests known to infest foreign bulbs. Surveys have since shown that these pests are now too well established in the United States to allow any hope of eradication. Unlimited entry of bulbs does not mean, however, that the United States will become a dumping ground for disease-infested bulbs, as the government maintains a thorough inspection of all shipments at ports of entry. The new Federal regulations involve a removal of quarantine, and leave the various states free to establish such local restrictions as they may deem advisable.

Eighty young chestnut trees—5 plants each of 16 different types of *Castanea crenata* and *C. mollissima*—were received this spring from the U. S. Department of Agriculture and were planted in favorable spots throughout The New York Botanical Garden. These trees will be inspected every year by representatives of the Department of Agriculture and will be studied by the members of the staff of the Botanical Garden as part of the national campaign to raise blight-resistant chestnuts.

A new group of ornamental shrubs—comprising 184 selected best varieties—has been planted this spring in The New York Botanical Garden. This group is located north of the traffic circle in a field which was formerly occupied by a part of the Fruticetum. The shrubs are displayed against a background of conifers and are arranged according to their flowering season; starting with early spring-flowering Hamamelis, *Rhododendron dahuricum, Daphne Mezereum,* etc., and extending over summer into late autumn; ending with *Gordonia Alatamaha*. A number of varieties still rare in cultivation, such as *Stewartia pentagyna grandiflora, Viburnum fragrans,* and *V. Wrightii,* as well as the newest hybrid Philadelphus, Deutzia, and Spiraea have been included in this group. They will not, of course, present much display for a few years.

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A GLANCE AT CURRENT LITERATURE

NOTES, NEWS, AND COMMENT

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THE EEL-WORM DISEASE OF GARDEN CHRYSANTHEMUMS

The plant pathologist as well as the gardener sometimes insists on looking for a "disease" to account for poor growth in his plants when the trouble is due mainly to poor soil conditions or faulty cultural practices. An interesting example of the reverse situation is afforded by the way certain varieties of chrysanthemums in the Garden continued to be a very inferior lot for a few years.

It was the practice to plant many varieties of chrysanthemums in a border close by a rather dense growth of shrubbery. A few large trees also were near enough to send their roots out under the beds. It was observed that while all the varieties showed the effects of this competition, some seemed much more affected than others. Certain varieties also showed symptoms suggesting a virus disease by the way the plants became stunted and distorted and failed to bloom at all. In some beds most of the plants died out before the blooming season. The basal leaves would be the first to become streaked or spotted with yellowish brown patches. Later they would curl up, turn black, become hard and brittle, and fall off (FIGURE 1).

Several leaf-spot fungi such as species of Cylindrosporium, Cercospora and the well known Septoria were isolated from the dying leaves, and Fusarium and Rhizoctonia, two well-known root-rot fungi, were frequently isolated from decaying rhizomes and roots. As inoculations of healthy plants with pure cultures of these fungi failed in every case to produce the characteristic disease symptoms, it was concluded that the trouble must be due either to a virus dis-

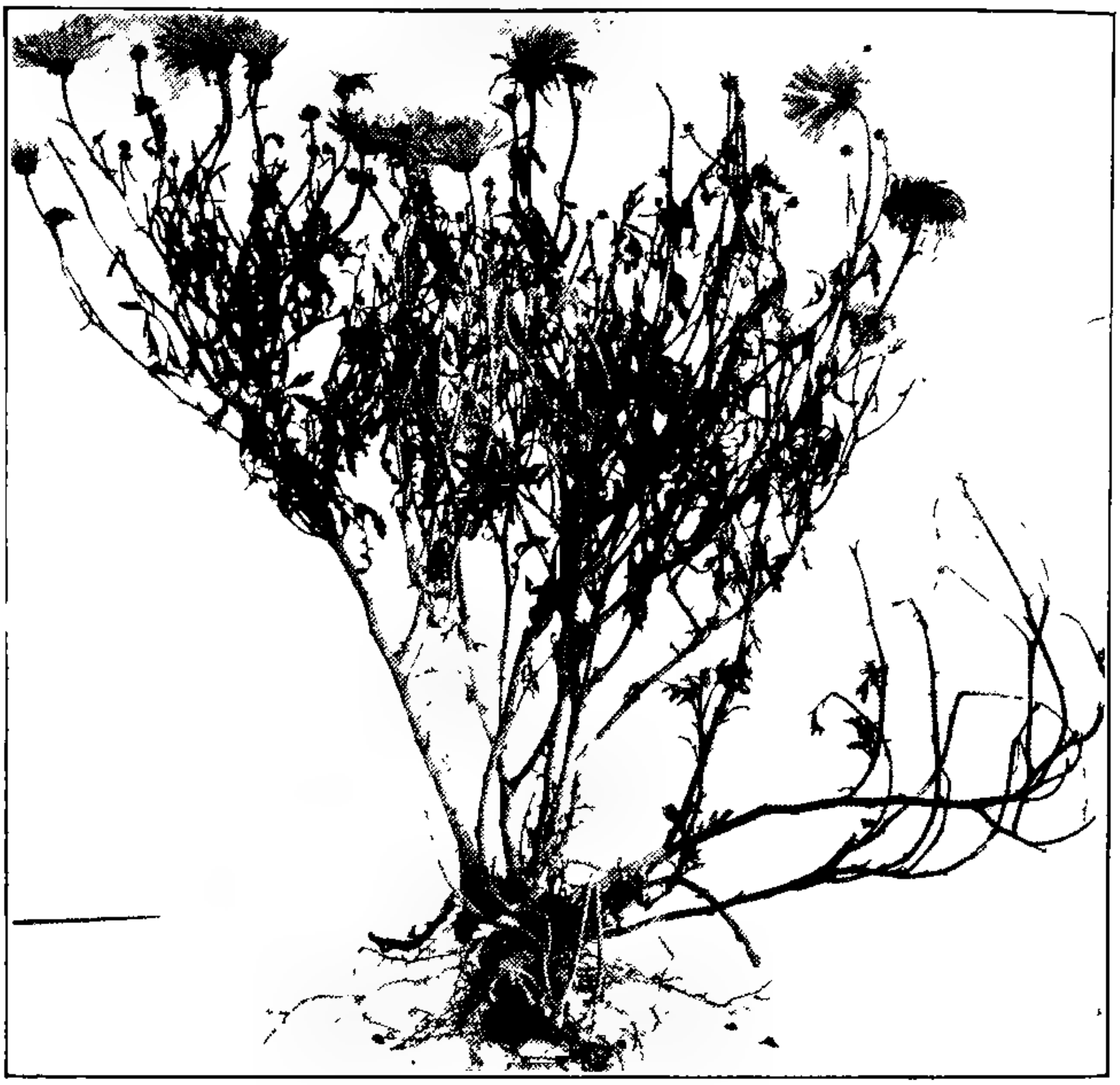

FIGURE 1. Chrysanthemum with all of its leaves and most of the flower buds badly infested with nematodes. A few flowers managed to open. The plant was stunted and unsightly at the height of the blooming season.

ease or to the unfavorable location or faulty cultural practices. The location of the planting was changed in 1932 to a place where there was no competition from trees or shrubs, but where the soil was still very poor. There was a great improvement in the plants that year and only three or four varieties showed extensive blackening of the leaves. All of the plants in two or three beds of yellow varieties were considerably stunted in addition to the browning of most of their leaves by the end of the season. These particular varieties were much worse in 1933. Then practically no blossoms were formed and the tops of most of the plants were in a dying condition by the end of August. Other varieties also showed some loss of leaves.

In 1934 the location of the planting, for other reasons, was again changed to the "Borders," where the soil was very good and where there was a good supply of water. It became evident during the month of August that it was not the location, lack of fertilizer and water or any other faulty cultural practice that had been responsible for the poor showing in previous years. Some serious disease was surely present. Here again certain varieties grew vigorously and blossomed profusely while others became stunted, their leaves gradually turned black and fell off as in previous years. The fact that some plants of the variety Carrie, for example, developed rather normal blossoms, while practically all the leaves had turned black or had fallen off, was evidence that it was not a virus disease such as that which causes aster yellows.

Some years ago we had had considerable trouble with the stem-nematode or eel-worm in the phlox planting,[1] but the symptoms were quite different from anything shown by these chrysanthemums. At various times a number of varieties of ferns in the greenhouse also had been seriously infested with eel-worms. In some varieties the blackening was confined to very definite streaks leading straight out from the midrib. In other forms, such as the bird's-nest fern, the whole leaf gradually turned dark-brown, beginning first at the base. In still other varieties the leaves were spotted much as was the case with our chrysanthemums. Recalling those symptoms we examined the chrysanthemum leaves for nematodes. It was found that numbers of worms could be obtained from almost any of the leaves showing the brown streaks or patches. Eel-worm diseases of potted chrysanthemums have been well known for many years in this country and in Europe, but references to such serious troubles in the garden varieties have not been made very frequently. Material was sent to Dr. George Steiner of the United States Department of Agriculture. He identified the nematode and suggested some experiments to determine the possibility of working out somewhat better methods of control than those usually recommended for greenhouse varieties. He says, in regard to the name of the species: "Your letter of October 20 and the chrysanthemums were received. They are infested by the

[1] Steiner, G., and B. O. Dodge. The bulb- or stem-nematode (*Tylenchus dipsaci* Kühn) as a pest of phlox. Jour. N. Y. Bot. Gard. 30: 177–184. 1929.

so-called chrysanthemum nematode which we consider to be *Aphelenchoides Fragariae* Ritzema Bos. Some authors still consider this to be a different species and call it *Aphelenchoides Ritzemabosi* (Schwartz, 1911). The fern nematode with which you were troubled some years ago, and perhaps still now, we also consider to be the same species. There are no morphological differences, except perhaps that they are of somewhat smaller size. . . ." "Would you mind keeping some of the infested plants with developed flower heads until the seeds have developed and then let us have some of the seeds? In the plants you sent us the nematodes were present in the seed *anlage* and in the petals, but we should like to know if the disease in this case may be spread by ripe seeds."

There are many species of nematodes that infest plants, causing in each case rather characteristic diseases. The work of the root-knot nematode is familiar to all who grow plants extensively in the greenhouse. Eel-worms that parasitize plants are usually too small to be seen clearly unless they are magnified. It is said that one can obtain as many as 5,000 from a single infested leaf. FIGURE 2

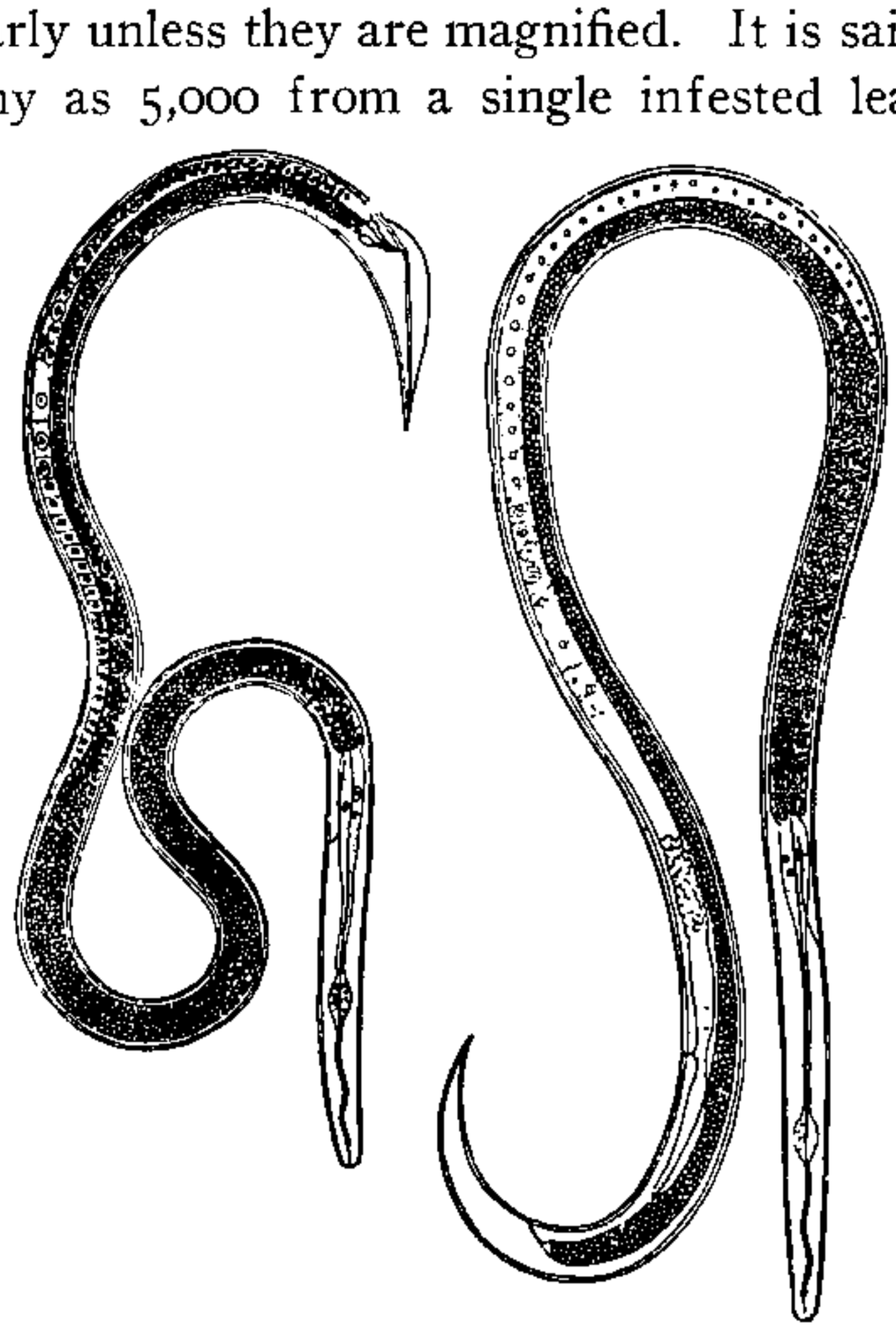

FIGURE 2. Male and female nematodes of the species *Tylenchus Dipsaci*, the species of stem-nematode that infests such plants as garden phlox (from Marcinowski).

shows a pair of stem-nematodes of the kind that often infest garden phlox. In olden times when people made their own vinegar one could see hundreds of these little wriggling eel-worms by looking through the vinegar cruet.

CONTROL MEASURES

The phlox eel-worm infests the stems more or less systemically so that spraying the plants with contact insecticides is not effective. The chrysanthemum eel-worms on the contrary come up out of the soil when the dew is on, or when the plants are wet from rain or from watering, and swim up on the surface of the stems and out on the leaves, where they gain entrance to the tissues through the stomata. Cook (Gardeners' Chronicle for June 11, 1927) reports that he obtained good control without injury by spraying his potted plants twice a week for three weeks with a very strong solution of nicotine (one half an ounce of a 95 per cent purity nicotine to one gallon of water). It has been our experience that Dahlias will stand spraying with a solution of nicotine sulphate three times as strong as that recommended for most other plants. Evidently chrysanthemums are very tolerant also and it may very well be that garden varieties could be freed of nematodes by spraying them frequently with contact sprays such as nicotine sulphate with the addition of soap.

A program for controlling leaf-nematodes in hardy chrysanthemums would certainly begin with the obtaining of cuttings from healthy stock. If they are to be planted in garden plots where the disease has been prevalent the preceding year the soil should be sterilized. The most practical way is to apply formaldehyde. The exact proportion is not so material as is the amount of the solution one can apply and have it all soak in. For example, some recommend a 1 : 50 solution (one gallon of 40 per cent formaldehyde diluted to make 50 gallons of solution) applied at the rate of one gallon of the solution to eight square feet of soil surface. If the soil is very dry this amount will not wet down far enough. Others use one pint to 25 gallons of water (1 : 200), one gallon applied to each square foot. This would be all right for a very dry soil but a moist clay would not soak up that amount, and the fumes would be too weak to kill nematodes and fungi. For the average soil, dug up and thoroughly pulverized before the solution is applied, we have

found that a 1 : 100 solution at the rate of one half a gallon to each square foot is very satisfactory. In order to prevent rapid evaporation the treated plot should be covered with about an inch of uninfested soil; or the ground may be covered with old blankets or tenting for a few days. After about a week the ground should be again dug up and allowed to air out for a day or two more before planting.

If one must take his cuttings from infested stock it is possible to destroy most of the nematodes present by applying the hot water treatment. On this point Dr. Steiner in a personal communication says: "No cuttings from such infested plants should be used for propagation. Stems, leaves, and flowers should be burned. Treatment of the roots and the crown (the latter to be cut back as much as possible) with water of about 118° F. for one half hour may free them of the nematodes, but the best thing would be to destroy all the infested plants and start anew with cuttings from uninfested material." In a later letter he adds as a caution: "In regard to the treatment of chrysanthemums for the chrysanthemum nematode, we wish to say that, according to some tests made by Dr. Christie, this nematode can be controlled if the plants are treated for one half hour at 120° F. If the water is to be only 118° F., he found that the treatment should be for 52 minutes. We figure that the root stocks of these plants would tolerate such a treatment. Personal experience, however, is lacking. Years ago Marcinowski recommended that the stems of diseased plants could be protected by a ring of vaseline at the base of the stem and by cutting off the leaves close to the ground so there would be no possibility of reinfestation by sprinkling or rain-water. It is thought that this nematode climbs up the plants on the outside of the stems and leaves while they are wet. Therefore one can greatly reduce the damage done by this disease by careful watering—avoid wetting the stems and leaves."

Obviously the statement as to ringing the stem with vaseline refers to protecting valuable potted varieties. The hot-water treatment would apply to garden varieties just as well where it is necessary to use infested plants as stock. We succeeded in obtaining perfectly free new growth from a badly infested plant that had been pulled up from the garden in December and treated roots and all for half an hour at 120° F., after which it was immersed in cold

FIGURE 3. Chrysanthemums in a border. Those at the left in the foreground, variety Carrie, badly stunted and dying from a heavy infestation of the leaf nematode. Variety at the right not stunted particularly but few of the buds opened, and the leaves, especially at the base, black and brittle. Plants in the background fairly resistant; only a few of their leaves were infested.

water. But for growing plants such a high temperature would not be safe, as was proved by experiment.

The chrysanthemum leaf-nematode is well known to infest several other garden plants, causing diseases with similar symptoms. Dahlia leaves often become distorted and discolored in spots, turning black and becoming hard and brittle as though burned. This condition has usually been referred to as hopper burn. The stunting of plants and the failure of blooms to open or develop properly are also symptoms that would suggest the possibility that some of our dahlia troubles may be due to nematodes.

B. O. Dodge.

JAPANESE VIBURNUM RUNS WILD IN THE GARDEN

Long graceful boughs heavily laden with white flowers until they look snow capped, are now scattered all through the shady woodlands at The New York Botanical Garden. These are the single flowered form of the Japanese Viburnum (*V. tomentosum*). The flowers are in flat-topped cymes four inches across, and the showy effect is due to the large glistening white sterile blooms surrounding the small creamy white fertile ones. The flower clusters are so abundant on the upper sides of the branches of these tall six to eight foot spreading shrubs that they make broad bands of white bloom against the lush green of the large, deeply veined leaves. The double form of this species, *Viburnum tomentosum* variety *plenum,* in which all of the blooms are showy sterile ones, are the Japanese snowballs of the garden.

The Japanese Viburnums develop clusters of small red berries in late summer, turning black in the autumn and hanging on the bushes until the birds strip them off early in the winter. The birds relish them and have scattered the seeds all through the woodland, which accounts for the naturalization of this and other attractive exotics through our natural woods. This Viburnum is worth introducing into shady gardens, both for its lovely flowers and as food for the birds.

Forman T. McLean.

PILULARIA REDISCOVERED IN THE EAST

The genus *Pilularia* was named by Linnaeus in 1753, based on the European species, *Pilularia globulifera.* The name is in reference to the pea-like sporocarps.

In 1818 Thomas Nuttall set out from Philadelphia on a 5000 mile journey through the little-known Arkansas country west of the Mississippi River, returning to Philadelphia in 1820. While at Fort Smith on the Arkansas River, he collected specimens of a *Pilularia.* In a list of the plants collected, published in 1834,[1] Nuttall mentions the *Pilularia* merely under the generic name.

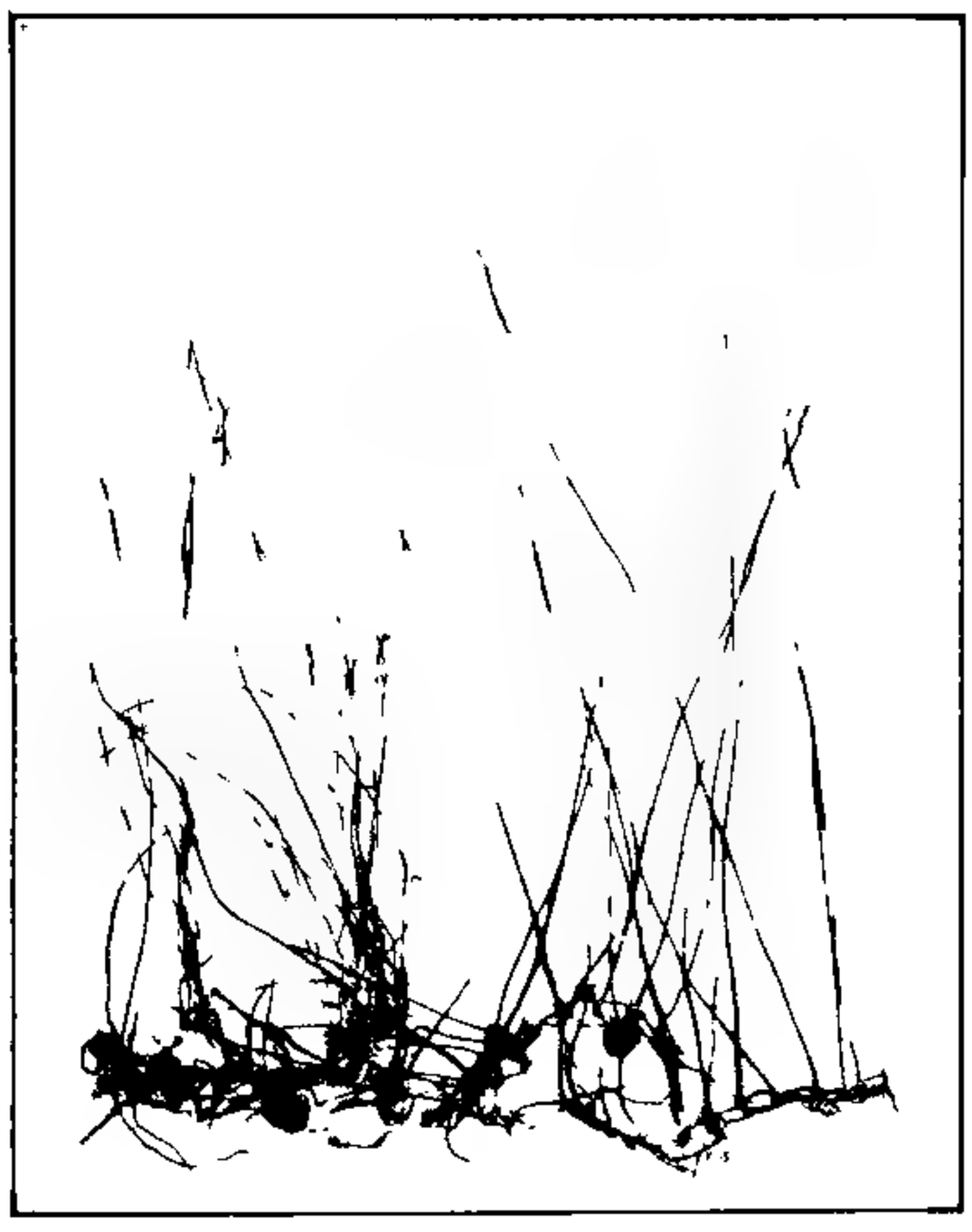

FIGURE 1. The specimens of *Pilularia* of Nuttall's collection from Arkansas (1818–1819). Intact sporocarps may be seen at the right and at the left among the leaf-bases.

Three decades later, Alexander Braun named and described the species as *Pilularia americana,* from a specimen of Nuttall's Arkansas collection. Later the same plant was discovered on the Pacific Coast. Specimens collected by Nuttall are scarce. There is a specimen in the herbarium at The New York Botanical Garden.

[1] Transactions of the American Philosophical Society. II. 5: 140. 1837.

FIGURE 2. Specimens of *Pilularia* of the Biltmore collection from Georgia (1901). Intact sporocarps may be seen among the leaf-bases.

On the sheet Dr. Underwood wrote in 1897: "So far as I know this is the only plant of Nuttall's 'Arkansa' collection of this species in existence." A short time ago Professor D. M. Moore, of the University of Arkansas, told the writer that the Arkansas botanists were trying to rediscover *Pilularia* in that State. The following day the undersigned happened to be looking over some fern-allies in the Garden herbarium and was surprised to find a specimen of the species collected in shallow water in a depression of rock, Winder, Georgia, July 19, 1901, by collectors of the Biltmore Herbarium, No. 14974. Curiously enough, this collection, which brings the plant far east of the Mississippi River, seems to have escaped being recorded in our fern literature. The accompanying figures may be interesting to fern students.

If collectors in the Piedmont and Onachita plant provinces and even in the adjacent provinces, were to search for this plant, it might be found to be more widely distributed.

JOHN K. SMALL.

THE GARDENING CLASSES—A RETROSPECT

Three years ago a series of Fall and Spring gardening classes for amateurs was inaugurated, under the direction of Dr. McLean. A part of the propagating coolhouse was allocated to the purpose,

FIGURE 1. Spring gardening class in session.

a space sufficient to hold about 500 seeding flats, and it was promptly filled by a capacity enrollment. The following year the number of applicants was somewhat less, but increased this past season. Plans are under way for varying the course in 1935–36; and the results of each added year's experience will doubtless render it more and more valuable as time goes on. The fee is $25 for the spring semester, entailing three hours of professional guidance each week, and, of course, access to the greenhouse throughout the term. Several of the students have already raised enough plants for their own gardens to far more than offset the registration fee, although the course is by no means intended as a profit-making venture. On the contrary, all of the members have undertaken it primarily from the desire for first-hand knowledge in plant management. Some came with the idea of increasing their stock of rarities or of plants difficult or expensive to procure in this country, such as certain lilies, mold-resistant phlox, and daphne, some to

FIGURE 2. An overflow assortment of hardy, tender, and annual plants raised from seed in the gardening class.

discover the proper care of house plants, some with very personal hobbies, but all of them developed an avid zeal in the horticulturist's work quite apart from the exact nature of their activity. Not one dropped out, in spite of the demands of the work. The well-known therapeutic values of gardening were markedly demonstrated in several instances.

Perhaps there could be no better way of indicating the extent of accomplishment than by describing the greenhouse as it appeared one day toward the close of the course. It must be remembered that the Fall course naturally is rather more concerned with the care of house plants, slipping garden stock, starting perennials and bulbs, constructing terraria, and other indoor subjects. Each member is assigned space on the benches, and as the slips or seedlings develop, these are transferred to the upper shelves for hardening off, to be replaced by new flats, whence they are eventually removed to the owner's home, thus giving actual space for at least two dozen flats per person in the course of the term. As each flat will hold about fifty average-sized seedlings, somewhat thinned, it is possible for each student to grow a thousand or more plants.

Everyone is anxious to take his productions home as soon as they can be safely transported, so that at any one time only young plants are to be found in the greenhouse. Let us see what was in evidence at the end of the spring session.

On the left as one entered a large pan contained about a dozen pots of an ordinary mixture of peat moss, loam, and sand, the surface of most of them covered with the scumlike green of the prothallia of various Athyrium and Dryopteris; and in two pots the tiny new fronds of the Japanese shield fern, *D. erythrosora,* were showing. They are perhaps the first to be raised in this country, inasmuch as only a very few plants of the species are known to be in cultivation here. It is not necessarily a difficult job to raise ferns from spores but it requires much patience. All of these had germinated prothallia within a few weeks of sowing, but it was a matter of six months' careful attention to moisture, light, and temperature, before the first fronds appeared. The same student had a large flat of young bracken plants, sown at the same time as the others, though these had responded more promptly and produced actual fronds two months after sowing.

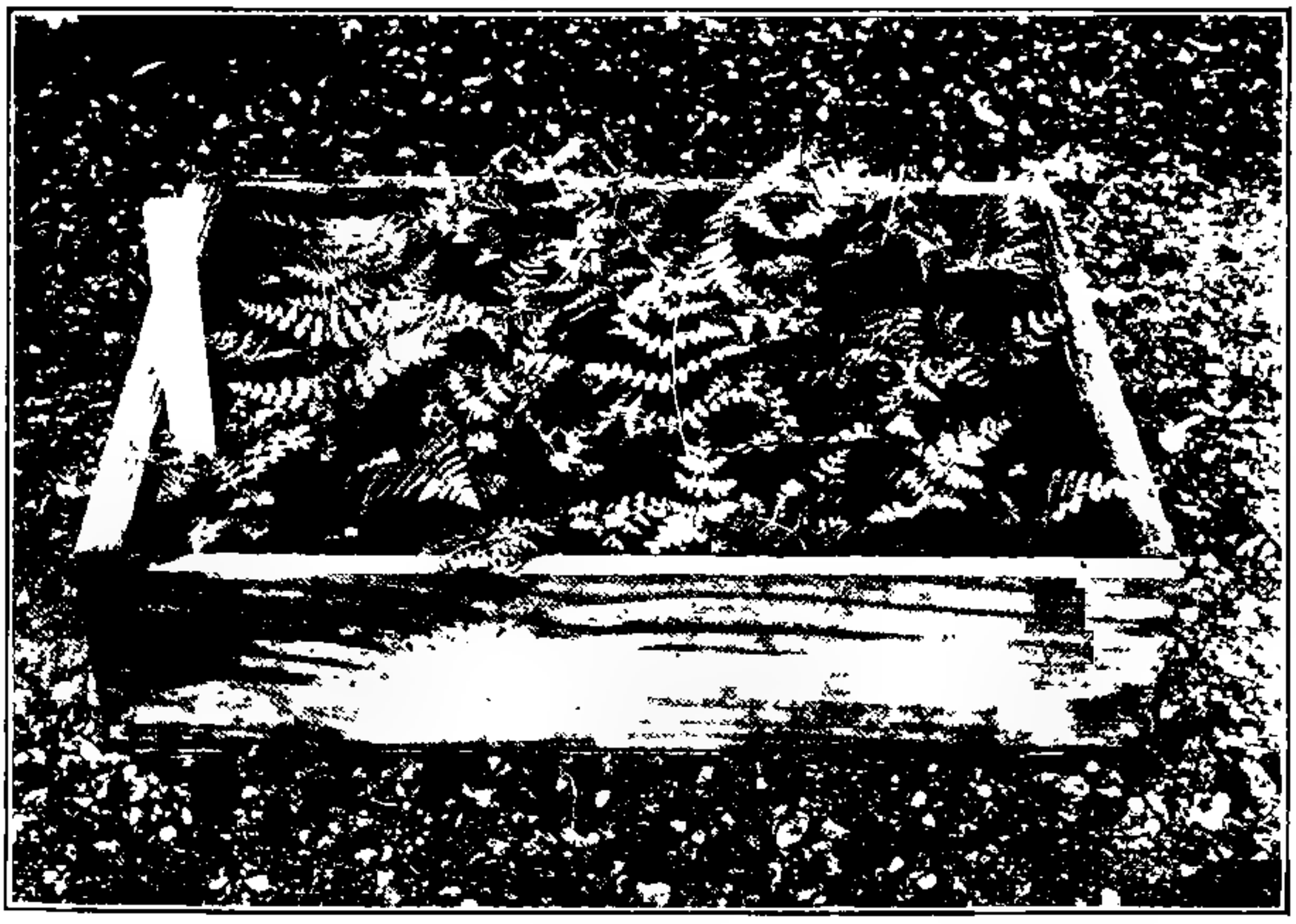

FIGURE 3. Bracken plants six months after the spores were sown.

Beyond the ferns were some yellow callas in blossom, and some more perfect but flowerless specimens by a rival grower. The callas had just blossomed, and there was a good deal of excitement between the two gardeners. One woman had planted bulbs from different sources of supply and discovered, as so often happens, that those purchased from the five-and-ten-cent store were much the best. An interesting exhibit was several flats of bright new grass, where a member who owned a large estate was testing seeds of bent grass. There were quantities of dianthus, a favorite selection, young magnolias and daphne, some rare violets from seed surreptitiously gathered in a famous royal garden abroad, varieties of lilies, a boxful of cardinal-flower plants, which the owner was exchanging for other moist-ground plants, balcony-blue petunias, which are rather expensive to buy, and other sorts of petunia planted at the same time to test the relative vitality of different sorts, wild flowers in quantity, and, in the sandy section, numerous rows of *Hedera colchica,* begonias, dianthus, chrysanthemums, lilacs, and other slips. One woman had raised wild roses from seed and was planning to commence grafting operations. Even root grafts had been attempted, and several comparative experiments in grafting lilacs on privet. Lettuces were obviously a popular subject, a variety of excellent plants standing ready for transplanting and early summer supply. A certain student had developed a passion for tomatoes, and another for Chinese cabbage, seldom found in our markets. Two enterprising members of the class had grown large numbers of sturdy plants as their contribution to a garden club sale.

An overflow of stock had found its way to the shaded alley outside of the greenhouse, and among these was an intriguing looking boxful of mixed plants destined as a farewell gift to a police officer who had evinced much interest in the weekly class.

It is readily seen that the possibilities are limited only by the restrictions of space and the cool greenhouse conditions. One of the most appreciated features of the course was the active interest taken by all members in the work of the others. Each of the individual projects has been followed step by step by the other students, so that, in total, a rather considerable amount of specialized and direct knowledge in the handling of plants has been acquired in a relatively brief time.

BRIEF REVIEWS OF SOME WORTH-WHILE BOOKS

A LONG-NEEDED HANDBOOK

Quite apart from its subject-matter, Dr. Gleason's recently published "Plants of the Vicinity of New York"[1] is an interesting and ingenious book. Its method of tracking down the name of a plant has all of the elements of a good detective story: if one follows the given clues and fails quickly to identify the culprit as *Trillium undulatum* or *Linaria vulgaris*, it is no fault of the author. Botanists will miss a lot of fun that hikers, campers, vacationists, and country dwellers are going to have with this book.

Popular interest in nature study has undoubtedly increased during the last decade. There is a large number of persons who exhibit a genuine interest in the plant world and whose curiosity carries them on to investigate it, as and when they can, but who for some reason can not afford the time for scientific study. Few of us can readily forget the early period of our life when, through the help of brightly illustrated handbooks, we first discovered the beauty and interest of Nature—birds, mammals, and reptiles, as well as plants. The books we had to depend on, and which are still the only sort of popular information available, usually proceeded upon categories such as "Conifers," "Nut-bearing trees," "Plants with pink flowers," "Plants with yellow flowers," and buttressed this rather weak structure with plenty of gaudy, if not always accurate, color plates. At first we relied largely upon the plates; the bits of botanical description were little more than a superfluous mystery. If the plant we were looking for happened to be a common or showy one, we would be sure of finding its name; but there were many plants we could not identify, and more often the particular species was represented only by other members of the genus. There came a time when the popular handbooks were of no further use. What we desired was a complete flora of the region in which we lived, written in non-technical language, and enabling us to make positive identification. If we consulted such a work as Taylor's "Flora of the Vicinity of New York," we would be baffled. We might remember that Gray's Manual had often been referred

[1] Gleason, H. A.: Plants of the Vicinity of New York. 284 pages. The New York Botanical Garden, New York, 1935. $1.65.

to in the elementary guides, and we might even buy the expensive volume, only to realize that before being able to make head or tail of it we would certainly have to devote some solid study to structural botany. I think it is at this point that many persons have decided that further acquaintance with the plants they come into contact with so often, except from what they may casually pick up from country people and woodsmen, must remain beyond their ken.

"Plants of the Vicinity of New York" is a first guide to our complete local flora, intended for the uninitiated and worked out on a non-technical plan. It is of proper size and binding for field work, runs to less than three hundred pages, and actually makes identification possible, for most species, within a few minutes. Apart from the index, a brief glossary, a dozen pages of clearly illustrated explanation on the structure of plants, and a couple of pages of directions for using the book, the content is devoted to a series of references whereby any of the 1,500 species native to this region may be tracked down and identified, beginning with and supposing only an accurate observation of obvious characteristics of stem, leaf, flower, and fruit, and, in the case of trees, often dispensing with flowers and fruit. The arrangement is based not upon cryptogamous and phanerogamous plants, but upon these seven groups: woody plants, vines, aquatic plants, unusual plants (leafless, parasites, carnivorous), ferns and their allies, herbs with parallel-veined leaves, and herbs with net-veined leaves.

The merit of the book can best be made evident by illustration. Assume that, for some reason, we observe a tree in our June woods and want to discover its name. We notice it carefully, see that it is not large, of rather open growth, has a dark gray, smooth, and patterned bark, no flowers in evidence, simple alternate leaves of an ovate shape rather coarsely toothed and conspicuously veined. This is all the data we have to go on. We open the book to the Key to the Groups, find the subdivision of Woody Plants, where two choices are given us, one of trees reaching to a height of twenty feet or more and the other of shrubs without a well-developed trunk. Our plant obviously belongs to the first of these, and we are referred by number to the key for use with trees bearing leaves but no flowers. Here we are given a choice of needle-like linear leaves, or of flat leaves over 5 mm wide and falling in autumn. We select the latter, and are referred to the category of opposite and

alternate leaves. We check with our plant. The leaves are alternate: the decision sends us to the choice of compound and simple leaves; ours are simple; we go on to the triple group of lobed, toothed, and entire leaves—ours are toothed, which sends us to another triple choice: leaves spiny on margin, thick and evergreen; stems with thorns, leaves not spiny on margin; and thorns and spines none. Our leaf and stem having no spines, we select the last group and are referred to one dealing with the symmetry of leaves. Ours are quite symmetrical, which sends us to a group dealing with the nature of the toothing. We note that ours are finely toothed, which fits the second classification, and we are referred to a consideration of veins. The veins of this leaf are strongly developed, run quite parallel from the midvein and end in the teeth, which conforms to the first category of this vein-group, and we are referred to the Betulaceae, by page number. Here, in two similar steps we find our plant named, with such attendant description as to check beyond doubt with our specimen—the Hornbeam, *Carpinus caroliniana*.

To the layman, the directness and simplicity of the method will perhaps at first raise his doubts. Many persons will probably feel the need of verifying their decisions by other books. A very little usage however will convince anyone that, given careful observation, the method is astonishingly reliable. In the case of many species, whose identification depends upon characteristics of flower or fruit, it will be necessary to observe the plant in the proper season, but in all cases the genus at least can be ascertained. Excellent line drawings occur in the few essential places or where especially helpful. The whole plan of the book makes accuracy of observation indispensable. Teachers of botany in secondary classes should welcome it.

There is no attempt to offer any information about the plant, once identified, other than to mention any outstanding features beyond those already covered in the course of identifying it. This is to be regretted, as the mere discovery of a plant's name will hardly satisfy most persons sufficiently curious to use the book. The passion for names as names is certainly not shared by many people, and the man who goes about the woods pointing out the names of everything, unbidden, can make himself as unpopular as the tourist who runs on ahead in the museum and announces the

names of all the artists, in each gallery, or the lady at the opera wh insists upon whispering the tags of the Wagner leitmotives eacl time they appear. Of course, in this book, as a field manual, i would have been impossible to include any but strictly relevant an essential material, but it would not have taken much space to add a few suggestions as to where and how to go about further study Anyone, for instance, finding some of the plumose and other form of the ebony spleenwort, not uncommon locally, will be puzzled a not finding them listed. Dr. Gleason has not gone into varieties much less forms, nevertheless, a bit of explanation about this sub ject, for example, would be useful. One other improvement, in a second edition, would be a brief key to pronunciation of Latir names, at least the insertion of accent marks, for although a com- mon name is given with the botanical garden name and preceding it, common names vary notoriously, even within a limited area, anc in many instances serve for numerous species. The whole purpose of the book being to give us names, it might tell us how to speak as well as to write them.

The area covered within the pages of this book extends out on a radius of about 200 miles from New York City, and is one unusu ally rich and varied in flora. If anything can promote further interest and satisfy a long felt demand it is this volume.

D. T. Walden.

HISTORICAL WORKS OF UNUSUAL CHARACTER

Lives of many men who were influential in the botanical anc agricultural development of the country are brought to light in twc books which have recently been added to The New York Botanica Garden's library.

"William Bartram: Interpreter of the American Landscape"[1]

Two of the most influential men in the early study of the natura history of North America were John Bartram and his son, William Not only was John Bartram one of the first and most conscientious students of the flora of this still new country, but he was th founder of the first botanical garden in the United States, nea

[1] Fagin, N. Bryllion, "William Bartram: Interpreter of the American Landscape." 229 pages. The Johns Hopkins Press, Baltimore, 1933. $2.25

Philadelphia. The garden, now part of that city, has lately been restored.

Linnaeus, with whom this remarkable self-taught man carried on an extensive correspondence, is said to have called him "the greatest natural botanist in the world." The author of this literary biography calls the "Travels" of the son "a book which was the first genuine and artistic interpretation of the American landscape, and which was to fascinate Romantic poets and nature-lovers in many parts of the world." After describing the powerful influence of the father upon the son, Dr. Fagin quotes many remarkable passages, which show a direct relationship between William Bartram's descriptions of the North American scene and the writings of such authors as Coleridge, Wordsworth, Lamb, Shelley, Carlyle, Tennyson, Emerson, Thoreau, Hearn, and even Chateaubriand. In his conclusion Dr. Fagin points out that William Bartram's famous expedition into the South proved not only to be a great event in botanical history, but a major contribution to the literature of the world.

"A History of Agriculture in the State of New York"[2]

If it were possible to distribute this book through a publishing house accustomed to cover a wide field, it would undoubtedly reach and absorb the attention of a horde of readers who otherwise may never see or hear of it.

Only Dr. Hedrick, who for many years has been and still is Director of the State Agricultural Experiment Station at Geneva, could have written so charmingly an authentic history of agriculture in New York. Spicy with anecdotes and quotations depicting the life and habits of the farm people of an earlier period in this state, the book is brought logically down to the present day, with its automobiles and experiment stations. The illustrations, which the author himself has selected, are a priceless part of the book. They include early towns, farms and farmhouses, implements, early pictures of crop-plants and animals, old railroads and taverns, and reproductions of some characteristic century-old etchings and of some suitable Currier & Ives prints, as well as modern scenes and portraits, besides curious notices and advertisements concerning

[2] Hedrick, Ulysses Prentiss, A History of Agriculture in the State of New York. 462 pages, 81 illustrations in half-tone. Published by the New York State Agricultural Society, 1933. $3.

early agricultural life and practices. The book is crammed wi personality, both of the state and its people and of the author wh knows them so well. The book is obtainable from the State Agr cultural Experiment Station at Geneva.

A "NEW" BOOK ON WILD FLOWERS[3]

When the State of New York issued, several years ago, "Wil Flowers of New York," by Homer D. House, containing magnif cent full-page illustrations in color, and reticently offered the tw volume set for sale at ten dollars, few were the purchasers. Th chief reason was, no doubt, that the State, not being in the publis ing business commercially, never seemed to think of advertising i books widely.

Macmillan's, however, last year evidently realized the possibilitie in this beautiful piece of work. As a result, the one volume i which "Wild Flowers of New York" has been reissued simply a "Wild Flowers" long ago reached the point of becoming a topic c conversation. Dinner parties, teas, and business luncheons, soo after the book came out, were likely to be aggressively started with "Have you seen . . .?" All referring to the new twelve-pound boo about wild flowers.

So the populace is acclaiming it.

Up to date botanists will not agree with the persistence in it c tautonyms, such as *Linaria Linaria*; others are going to object t the decapitalization of certain specific names, as in *Verbascum Bla taria*. Plant-lovers may tire of the common names offered whe they become so botanical-sounding as "Glutinous Triantha," "Ses sile-leaved Twisted-stalk," and "Elliptic-leaved or Pale St. John's wort," even though there is reason in such exacting distinction Students of local flora in the autumn months will note in the livin flowers decided deviations from some of the color plates, especiall in the yellow and orange tones of many of the Composites. An purists in English are likely to prefer their "Mullen" spelled "Mu lein." Nevertheless, one is bound to admire a splendid work c this sort, which entertains with its illustrations and teaches ampl with its text.

CAROL H. WOODWARD.

[3] House, Homer D., Wild Flowers. 362 pages, 264 full-page photograp in color, 35 photographs in half-tone, 95 drawings illustrating parts c plants. The Macmillan Company, New York, 1934. $7.50.

A GLANCE AT CURRENT LITERATURE

The excellent *Leaflets* of the Lexington, Mass., Botanical Garden are continued twice a month through the summer. Forthcoming subjects will be: Heuchera, Thalictrum, Achillea, Desert Effects in the Rock Garden, Sea-holly, Late-blooming Asters, and Hardiness in Perennials. These are a part of the fifth series of four-page bulletins about hardy plants being tested at the Lexington Garden.

* * * *

In connection with the Silver Jubilee the *Strand Magazine* for May has an article on the gardens of Buckingham Palace. Though superficial in treatment, it carries some good photographs, and pays tribute to the long career of Thomas Hay, M.V.O., who has been horticulturist of Hyde Park, Kensington Gardens, The Green Park, St. James's Park, Marlborough House, 10 Downing Street, and chief gardener to His Majesty for many years.

* * * *

Some excellent articles in the *Gardener's Chronicle of America* for May are: "Native Carpets from the Pacific Slopes," by Elsie M. Frye; "Our Garden Veronicas," by Dorothy Brigham; "Rock Garden Plantations," by Richard Roth, which points out the value in rock garden design of a happy union or tying together of rock and foliage, with interesting remarks about the breaking of flat sheets of color; and "The Beauty of White Flowers," by Frances Staver Twining.

* * * *

"Avocado Diseases in California" is the subject of Bulletin 585 of the Agricultural Experiment Station of the University of California. The intention is to bring together the results secured to date in the investigation of all known avocado diseases and injuries, with a résumé of control experiments. The bulletin runs to 75 pages and is well illustrated.

* * * *

Circular 42 of the Wild Flower Preservation Society discusses poison-ivy, poison-sumach, and poison-oak, the nature, symptoms, effects of their poisons, and preventatives, remedies, and eradication of the plants. The chief agent in the remedy recommended is a solution of ferric acid.

Among numerous interesting articles in *The Flower Grower* for May is one on the hunting of native orchids, by Arthur H. Osmun, valuable because of its definite and careful report of the soil and conditions in which each species is apt to be found.

* * * *

Nature Magazine for May announces a summer photography competition for amateurs, with a prize of $25.00 and an offer of $3.00 for additional prints accepted.

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The Federated Garden Clubs of New York State are distributing lists of fruit-bearing trees and shrubs furnishing food for birds. This supplements the excellent work the Audubon Societies have been doing in this regard for many years. The latest bulletin of the Audubon Societies is a beautifully illustrated, and persuasively written, 64 page booklet on Golf Clubs as Bird Sanctuaries.

* * * *

"Fruits for Northern Gardens" is the subject of Circular 103, published by the New York State Agricultural Experiment Station at Geneva.

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A simple explanation of fasciation—so far as it can be explained—is given in an illustrated article by Leslie J. Haskin in the April *Nature Magazine*.

* * * *

Persons interested in the flowers of the West will be glad to see "Spring Wild Flowers of the Open Field" which has recently been published as one of a western nature-study series for San José State Teachers College. This small book contains sixty photographs of wild flowers reproduced in half-tone.

* * * *

"Trees of Note in Connecticut" is the title of another small new book, compiled by Katharine Matthies for the Daughters of the American Revolution of her state. Divided by counties, trees noted for their history, size, beauty, or age are briefly described, located, and usually illustrated.

* * * *

Two studies of diseases of tomato have recently been undertaken: one on control of psillid yellows by Lester B. Daniels, results of which have been published as Bulletin 410 of the Experi-

ment Station of Cornell Agricultural College; the other on leaf-mold resistance by L. J. Alexander, reported in Bulletin 539 of the Ohio Agricultural Experiment Station.

* * * *

Woody plants that tolerate shade are listed and described in Cornell Extension Bulletin 268. R. W. Curtis and Donald Wyman are the authors.

* * * *

Nearly 300 pages are devoted to the wild flowers of Kansas, in a new, illustrated, paper-bound volume by Frank C. Gates. The book is published by the Kansas State Board of Agriculture.

* * * *

A revision of the genus *Arctostaphylos* with key and descriptions, is given by Alice Eastwood in No. 11 of *Leaflets of Western Botany.*

* * * *

Part 1 of volume II of the *Moss Flora of North America,* edited and published by A. J. Grout, is now in the Library of the Garden. This section, which has been prepared by George Neville Jones, is on the Grimmiaceae.

* * * *

Bluhende Kakteen und andere sukkulenten Pflanzen appears with its usual beautifully colored plates showing cacti and other succulents. Among the interesting subjects shown in Mappe 22 are *Echinopsis densispina* and *Hcurnia zebrina.*

* * * *

Continuing his work on clematis, J. E. Spingarn writes on the large-flowered hybrids in the March *National Horticultural Magazine,* giving illustrations, descriptions, keys, and a tentative check-list.

NOTES, NEWS, AND, COMMENT

Dr. E. D. Merrill, Director of the Garden, has been elected a Corresponding Member of the Nederlandsche Botanische Vereeniging, in acknowledgement of the services he has rendered to botany. The diploma of the Society will be formally presented to Dr. Merrill at the reception in connection with the 6th International Botanical Congress at Amsterdam on September 1, 1935.

The National Research Council has recently made a grant to Dr. A. B. Stout for travel expenses and technical assistance in connection with his study of seedlessness in grapes. Dr. Stout is devoting the latter half of June to this work at the Agricultural Experiment Station at Geneva, New York.

Dr. Bernard O. Dodge was elected a Fellow of the American Academy of Arts and Sciences at the regular meeting of the Academy in Boston on May 8th last.

A new station and the northern limit thus far recorded has been established for the filmy fern, in Ohio, by Dr. George O. Beery, of Lancaster, Ohio. The discovery is reported in the April issue of *Wildflower*.

A complete index to the first twenty-four volumes of *Mycologia* was published by the Garden in May. This covers all material published from 1909 until January, 1933, when the journal became the official organ of The Mycological Society of America, and thus marks the end of the old régime. The work runs to over 300 pages and includes an index of authors and titles, and one of all fungus genera, species, and subdivisions mentioned in the pages of *Mycologia* in that period. Provision for the undertaking came out of regular *Mycologia* funds; and the actual compilation was due in part to assistance granted by the Emergency Work Bureau.

The following botanists have been registered in the library during the spring: Mr. Lawrence M. Ames, Jamaica Plain, Mass.; Dr. M. L. Lohman and Dr. T. T. Ayres, New Haven, Conn.; Dr. J. E. Spingarn, Amenia, N. Y.; Profs. L. H. Bailey and R. T. Clausen, Ithaca, N. Y.; Dr. F. O. Holmes, Princeton, N. J.; Prof. Edgar T. Wherry, Philadelphia, Pa.; Sister Elizabeth Seton, College of Mt. St. Joseph, Ohio; Miss Lois Lillick, Cincinnati, Ohio; Dr. Theodore Just, Notre Dame, Ind., and Prof. F. E. Lloyd, Montreal, Canada.

PUBLICATIONS OF

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Journal of The New York Botanical Garden, monthly, containing notes, news, and non-technical articles. Free to members of the Garden. To others, 10 cents a copy; $1.00 a year. Now in its thirty-sixth volume.

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Memoirs of The New York Botanical Garden. Price to members of the Garden, vols. I–VI, $1.50 per volume; to others, $3.00. Vol. VII, $2.50 to members; to others, $5.00. Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by A. Hollick and E. C. Jeffrey. Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. Vol. V. Flora of the Vicinity of New York, by Norman Taylor. Vol. VI. Twentieth Anniversary of The New York Botanical Garden. Vol. VII. Includes New Myxophyceae from Porto Rico, by N. L. Gardner; The Flower Behavior of Avocados, by A. B. Stout; Plants Collected in the Amazon Valley, by H. H. Rusby; and The Flora of the Saint Eugene Silts, by Arthur Hollick.

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Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. Price, $5.50 postpaid.

Manual of the Flora of the Northern States and Canada, by Nathaniel Lord Britton. 1122 pages. Second edition, 1907. $2.50.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures. 1918. $3.50.

A Text-book of General Lichenology, by Albert Schneider. 230 pages; 76 plates. 1897. $2.50.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages. 1935. $1.65.

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Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

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A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

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Benefactor	single contribution	$25,000
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Annual Member	annual fee	10
Garden Club Membership.....	annual fee for a club	25

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All requests for further information should be sent to

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H. A. GLEASON

TREES AND SHRUBS OF THE ORIENT—IV
HENRY M. TEUSCHER

DIRECTOR MERRILL ACCEPTS HARVARD UNIVERSITY POSITION

THOMAS WALTER'S BOTANICAL GARDEN
JOHN K. SMALL

SOME OLD MASKS AND SHADOWS
DANIEL T. WALDEN

A GLANCE AT CURRENT LITERATURE

NOTES, NEWS, AND COMMENT

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THE REASON BEHIND SCIENTIFIC NAMES

If two people are going to talk together on any sort of subject, they must have names for things. Furthermore, they must have the same names for things, so that they can properly convey their thoughts to each other. If I think of a certain common shade tree, now much under discussion in this vicinity, and say elm, you at once think of the same tree. If I say gasoline, you know exactly what I am talking about. If I say gasoline to an Englishman, he does not know what I mean; he calls it petrol. If I say wallaba to you, you do not know what I mean. Possibly you might think of an Australian kangaroo, which is a wallaby instead of a wallaba, but what I mean is a common tree in northern South America. If you say house or mouse to a German, he will understand you, for the words are just the same, to the ear, in both languages, but if you try to talk about trees to a German tree-expert, he can not understand your English names and you can not understand his German names. You will have to get together in a language that both can appreciate, and the only system of names you can safely use is what we call scientific names. This is just one of the underlying reasons for the use of Latin names for plants. There are others which I will mention later.

"But," my neighbor across the street objects, "I can't pronounce those long scientific names. I like to grow my geraniums and rhododendrons, my iris and chrysanthemums; I like my fine magnolia and catalpa trees, but I can't learn those awful Latin names." Then I reply: "Every one of the names you have just used is a scientific name. If you do not like Latin names, why

don't you call your catalpa Indian bean, your rhododendron rose-bay, your chrysanthemum feverfew?"

"Well," he answers, "most of your names are too long and too hard to pronounce. Now let me show you my new rose, Frau Karl Druschki."

"My dear sir," I say, "not one scientific name in a thousand is as hard to spell or as hard to pronounce as Frau Karl Druschki, and all have three advantages which you can never get by using English names. First, they permit you to express your thoughts to students of plants in every country; second, they enable you to specify a particular kind of plant with far greater accuracy than is possible with an English name; and third, the name itself tells you a great deal about the plant, even though you have never seen it yourself."

The inaccuracy of English names is proverbial. The word ivy properly belongs to a European climber, often cultivated in this country, but we have also used the word for other kinds of plants which cling to walls or trail over the ground. Boston ivy is related to the grapes, not to the true ivy; poison ivy is a kind of sumac; Kenilworth ivy is more like a snapdragon than either. Here are four different kinds of plants bearing the name of ivy. To most people the word oak means a good-sized tree which bears acorns. But we also use the word to denote poison ivy and even a little herbaceous plant, while the Australians also use it for two entirely different kinds of trees. And so it goes with any number of other names. The use of the names, their application to plants, varies from one part of the country to another, and even from one person to another.

Now oak and ivy are in a way general terms, not intended to apply to one particular kind of plant, but to a whole group of plants. If we want to be particular about some kind of oak, we can say red oak or white oak or pin oak. But this does not always work, either. There are at least two kinds of post oaks, three kinds of black oaks, three kinds of chestnut oak, probably a dozen kinds of live oak, and even more kinds of scrub oak. Attempts have been made to standardize the English names of our trees, but it can't be done. Names are a part of our language, and a language can not be changed by law or proclamation. Out

around Lake Michigan is a rather rare species of oak, *Quercus ellipsoidalis.* The Forest Service says it should be called jack oak, but every farmer who has it growing in his woodlot calls it black oak, and you can't get him to change. Certainly you could never induce him to call it jack oak, because some millions of people in the middle west use jack oak for *Quercus imbricaria,* which the Forest Service says we must call shingle oak. You can invent new terms for new things, and have them generally accepted in a short time, like carburetor, magneto, or kodak, but you can not deliberately change a language. The English are not going to adopt a new word for sycamore, just because the Bible uses it in a different sense, and neither will the Americans. "Through the sycamores the candle lights are gleaming, on the banks of the Wabash, far away," and they will continue to gleam through the sycamores for a century to come, no matter what botanists or foresters may say about it.

Then the use of scientific names tells one a good deal about the plant. If you see or read about an ilex tree in England, it may mean nothing to you. But if someone uses the scientific name, *Quercus Ilex,* you at once get a very definite idea about the plant. You picture to yourself a large tree, slow in growth, with hard wood, bearing its flowers in catkins, and producing acorns for its fruit. Heretofore your idea of *Quercus* has been derived from your experience with the American oaks, now you expand your concept to include this new kind, you store your new knowledge away in a particular corner of your brain with all your previous experience with oaks, and you are a wiser man than you were before.

All scientific names are built in the same way. They invariably consist of two terms and they are always Latin in their form. The advantage of Latin is that it is a dead language. No one speaks it, and these Latin terms can therefore be introduced into scientific use just as we have introduced such new words as magneto and kodak, without interfering in any way with the spoken language of any country.

Individual plants are seldom of sufficient importance to have a distinctive name—with the exception of such noted plants as the Washington Elm or the Grizzly Giant. Names are given instead

to the various kinds of plants and designate all the individuals belonging to that kind.

Common names, used in ordinary speech of non-botanical persons, are given to many plants, such as wheat, apple, rose, oak. These names vary from one language to another, and in the same country often from one region to another. Different names are often used for the same kind of plant, and similar names are often applied to different kinds of plants. Common names therefore lack precision and can not be successfully used in science, where precision is necessary.

The reason we use Latin, instead of Greek, or Sanskrit, or Hebrew, is a historical one. Until about a century ago, Latin was the written language used for all branches of learning. Since the plants described in the older books were mostly European kinds, most of them had a Latin name already, which had been the common name used for them by the Romans. The Romans, however, generally did not distinguish the kinds of plants very carefully or very accurately. For example, there are several kinds of oak in southern Europe, but the Romans had only three names, *Quercus, Robur,* and *Ilex.* In scientific writings, the name *Quercus* was gradually adopted for all of them, and a qualifying phrase was added to this term to distinguish the various kinds of oaks from each other. With the spread of interest in plants into other parts of the world, many kinds of plants were discovered which had no Latin names, and new names were coined for them by the botanists. In every case the noun, which is the actual name, was a single word applied equally to one or several kinds of plants, provided these several kinds were sufficiently alike. Thus all kinds of pine had the name *Pinus,* and the one kind of chestnut the name *Castanea.*

The Swedish botanist Linnaeus was primarily responsible for replacing this system of a single name, followed by a procession of qualifying adjectives to describe and distinguish the plant, by the binomial system. In this system the original noun is still used, but the string of adjectives is replaced by a single word. While this word was often descriptive of a plant, it was seldom definite, that is, it did not enable one to distinguish the particular kind of a plant. It was therefore a name rather than a definition.

To give an example of how this new system saves words. All maples are named *Acer*. To describe the sugar maple sufficiently, we would have to say the maple which furnishes sugar and has leaves smooth beneath. We have taken eight words to describe this common tree. Instead we say *Acer saccharum,* and without description we name it with a single word.

This binomial system is still followed, so that each kind of plant known to science bears a name composed of two words. For example, five kinds of oaks found in the eastern states, differing from each other in the shape of their leaves or the character of their acorns, bear the names *Quercus alba, Quercus palustris, Quercus marylandica, Quercus Michauxii,* and *Quercus prinoides.* They, like all other kinds of oak, have *Quercus* as the first of the two words. To this is added a second word, and the whole may be translated as white oak, swamp oak, oak of Maryland, Michaux's oak, and oak like the chestnut-oak. Not one of these words is definitive; not one gives such information about the plant that a stranger could pick out that oak from the others; they are purely names. Yet they have this advantage: all of them begin with *Quercus,* and a foreign botanist reading about American trees can at once form some idea about these plants because of his knowledge of the kinds of *Quercus* in his own land.

The first of the two terms comprising a name is the generic name, the second is the specific name; that is, the first is the name of the genus (plural, genera) or general group to which the plant belongs, as oaks in general, while the second is the name of the species or particular kind of oak.

Generic names are always nouns, of classical origin or constructed in classical form. Several sources of such names may be recognized:

1. Actual classical names, taken directly from the Latin or Greek languages, as *Quercus, Rosa, Lilium, Populus,* and *Betula.*

2. Commemorative names, coined in memory of some person, usually one who has been of service to botanical science, as *Linnaea* (Linnaeus), *Torreya* (Torrey), *Bartonia* (Barton), *Magnolia* (Magnol), and *Robinia* (Robin).

3. Descriptive names, coined from one or more roots of classical origin and referring to some feature of the plant. Most of

these are from the Greek, as *Polygonum,* many joints; *Dryopteris,* wood-fern; *Ammophila,* sand-loving; *Rhododendron,* rose tree.

4. Aboriginal names of plants, provided with a classical ending, as *Catalpa, Sassafras,* and *Asimina.*

5. Fanciful or mythological names, as *Calypso, Arethusa,* and *Phoenix.*

Specific names are adjectives, or nouns in the genitive case, or nouns in apposition.

1. Adjectival specific names must agree in gender with the generic noun, as *Amaranthus hybridus, Rosa lucida,* and *Acer rubrum.*

2. Nouns in the genitive are mostly in commemoration of the discoverer or some person directly concerned with the plant, as *Quercus Michauxii* and *Amaranthus Palmeri.* Commemorative names may also be constructed as adjectives, in which case they follow the gender of the generic name, as *Spartina Michauxiana.*

3. Nouns in apposition are of various origins, but frequently represent old names for the plant, or for similar plants, as *Verbascum Thapsus* and *Quercus Phellos.* Sometimes aboriginal names are used as specific names of this class.

H. A. GLEASON.

DIRECTOR MERRILL ACCEPTS HARVARD UNIVERSITY POSITION

Dr. E. D. Merrill, for the past six years Director of The New York Botanical Garden, has accepted appointment as Professor of Botany and Administrator of Botanical Collections at Harvard University, to report for duty in October. His duties will involve the administration of the several independent botanical units of the University, including the Arnold Arboretum, the Gray Herbarium, the Farlow Herbarium and Library, the Botanical Museum, the Botanic Garden, the Bussey Institution, and the Harvard Forest.

FIGURE 1. *Corylopsis pauciflora.*

TREES AND SHRUBS OF THE ORIENT—IV

The genus Corylopsis belongs to the Witch-hazel family (Hamamelidaceae), which is renowned for the high ornamental qualities of many of its members. The name "Corylopsis" alludes to the superficial resemblance which these shrubs bear in general habit and leaf shape to the Hazelnuts (Corylus). However, this similarity does not go very far. Their flowers, certainly, are very different, and the foliage of the Corylopsis is much more graceful and ornamental than that of the Hazelnuts.

Twelve species of Corylopsis have been described—all native to Asia. Ten of them seem to have been introduced into cultivation. All of them have considerable merit as ornamental shrubs, but for no apparent reason they are much better known and more widely appreciated in Europe than in the United States. The two species which are pictured here are more frequently grown than any of the others, but even they are rare in American gardens. Both are native to Japan, and both were introduced into western gardens long before any of the Chinese species.

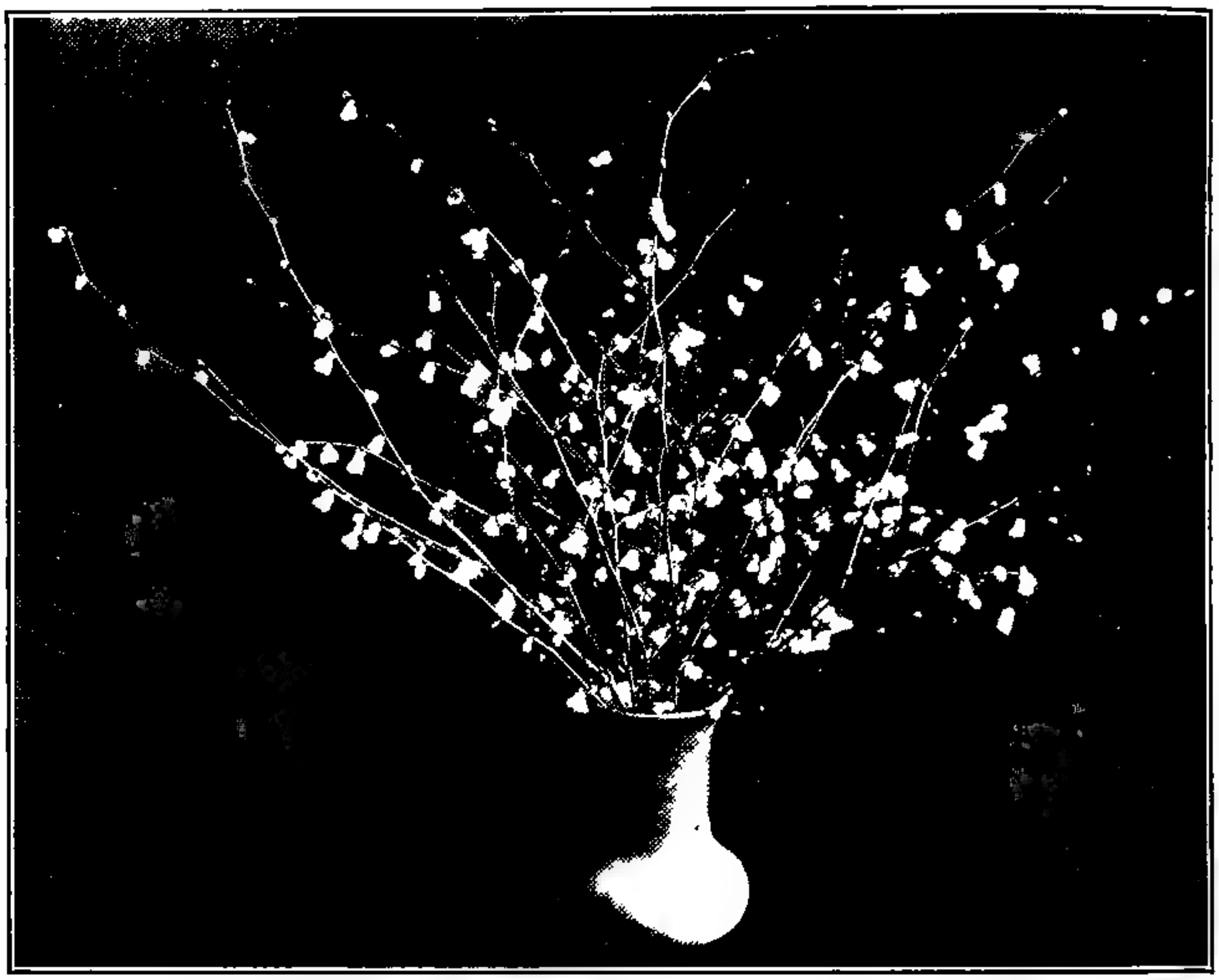

FIGURE 2. *Corylopsis pauciflora.*

Corylopsis pauciflora is, undoubtedly, one of the very best for general culture; not only because of its remarkable hardiness, its very graceful foliage, and its good, compact habit, but also because of its low stature. It does eventually reach a height of 5 to 6 ft., but it grows rather slowly. Two 15-year-old plants at The New York Botanical Garden are not yet 3 ft. tall. The reliable hardiness of this species was demonstrated during the severe winter of 1933–34 when our plants did not suffer the slightest injury and flowered in April as profusely as they always do.

Corylopsis spicata is a much coarser plant. Its leaves are larger and less handsome. Its flowers are produced in many-flowered racemes—bearing 5–10 flowers—which renders them more conspicuous, but they sit on stiff, thickish branches which never have the exquisite grace of those of *C. pauciflora*. The whole shrub is of more vigorous growth. Several plants of *C. spicata* at The New York Botanical Garden, which according to records must be about 40 years old, have reached a height of almost 9 ft. They

produce flowers only on their upper branchlets, which places them above the line of vision and spoils their decorative effect. During the winter of 1933–34 nearly all the flower buds and many branches on these plants were killed, which seems to suggest that this species is somewhat more tender than *C. pauciflora.*

The Chinese species: *Corylopsis Wilsonii, C. sinensis, C. Veitchiana, C. Willmottiae,* and *C. platypetala,* are in general appearance all more or less similar to *C. spicata.* They are all rather tall shrubs, with comparatively large leaves, and with their flowers in racemes. There is not one among them which would not be an ornament to any garden, but their hardiness needs further testing. Especially the three last-named species appear to be worthy of consideration.

There is, also, one more Japanese species, *Corylopsis glabrescens* (*C. Gotoana* of Rehder's Manual of Cultivated Trees and Shrubs), which is well worth growing. Its foliage is almost as delicate and handsome as that of *C. pauciflora,* while its flowers are produced in racemes like those of *C. spicata.* It grows rather tall and is said to reach a height of 18 feet. This is the only species of the genus which proved entirely hardy at the Arnold Arboretum.

FIGURE 3. *Corylopsis spicata.*

Propagation of all Corylopsis is easily effected from seeds, but, since seeds of them are not readily obtainable, one may take recourse to propagation from greenwood cuttings, which offers no difficulties. The best time to take such cuttings appears to be during the first two weeks of May and up to the end of May. The young side shoots will then have 4 or 5 leaves with their tips still growing. If these are cut from the twig at their base—but without "heel"—the two or three lowermost leaves removed, and these cuttings inserted into a mixture of sand and peat in equal parts, they will root up to one hundred per cent within eight or ten weeks.

HENRY TEUSCHER.

THOMAS WALTER'S BOTANICAL GARDEN

As recently recorded,[1] in the second half of the eighteenth century, the first botanical garden in the southeastern corner of the American Colonies, grew about the home of Thomas Walter on the Santee River north of Charleston, South Carolina. Walter's association with this native flora crystallized into the first manual of the plants of a more or less definite geographic area, under the title "Flora Caroliniana," published in 1788. Upon his death, Walter's remains were buried near his house back from the bank of the Santee. The place was soon abandoned, the house fell into ruins, and even the ruins disappeared from view. Still later vandals broke the marble slab which marked the grave. Recently the slab has been repaired and the grave fenced.

On one of our visits to the site of this former garden several interesting plants were found. The Old-Word fern *Pycnodoria* (*Pteris*) *multifida* was growing luxuriantly. A large isolated clump or thicket of buckthorn, *Bumelia lycioides,* stood, perhaps where Walter had started it. Most interesting were some fine shrubs of the rare star-anise, *Illicium parviflorum*. This plant has been known to grow naturally in southeastern Georgia and eastern Florida. Its presence in the site of Walter's garden demands supposition: either the shrub is native there, or it is native thereabouts and was brought in and planted by Walter, or brought up to the garden from down in Georgia or Florida during Walter's residence

[1] Small, J. K., Manual of the Southeastern Flora, ix. 1933.

there. The plants were in exceptionally fine foliage on our latest visit. No other woody plants suggestive of Walter's activities there nearly two centuries ago were in evidence.

JOHN K. SMALL.

SOME OLD MASKS AND SHADOWS

A picturesque and curious period in the iconography of plants is represented by several volumes scattered in the library of The New York Botanical Garden. They bridge the gap between the wood engravings of the 16th and 17th centuries and the etched copper-plates and lithographs of the 19th century. Some, but not all, of these volumes are catalogued under an index of "Nature Printing," and this file includes, as well, some 19th-century copper-plate and stone reproductions of the true nature-prints. Among these later works is the handsome folio edition of Moore's "Nature-printed British ferns" (1859) and the even finer ten-volume work by Ettingshausen and Pokorny, "Physiotypia plantarum austriacarum" (1865), containing about 800 exquisitely printed replicas of nature-prints. "The nature-printed British sea-weeds," by W. G. Johnstone and Alexander Croall (1859), and another work by von Ettingshausen, "Die Farnkräuter der Jetztwelt" (1865), are illustrated with engravings made from transfers of plant specimens, and, though doubtless of more value to the botanist, have nothing of the living hand-made quality and original vigor of certain earlier, 18th-century, books which comprise the direct transfers themselves.

A nature-print was nothing more than an impression taken from a green or dried specimen smeared or brushed with ink. A collection of these forms a veritable herbarium in facsimile. The silhouette, the texture, the surface veining, the character of minute hairs and certain flower and seed parts could be reproduced with perfect fidelity. Obviously the method was of no use for portraying any three-dimensional characteristics of structure; and prints from many plants with thick stems or very smooth or hard leaves, such as aloes, lilies, laurel, smilax, or firs, were difficult to make and of little value other than a decorative one. It is safe to say, however, that no artist could so accurately render the exact cutting

of elaborately pinnatifid fern-fronds, the hairy seeds of many composites, or the delicate venation of net-veined leaves. Moreover, the half-step of artifice demanded by the translation of the specimen to paper, with ink and press, gives the prints a genuine aesthetic merit, more particularly because of the purity, singleness, and limitation of the medium. A photograph loses its integral character when retouched, a drawing or painting loses its strength in mechanical reproductions. These nature-prints possess a legitimate quality as hand-made productions which is lacking in the later illustrations where a second process has intervened. Some fine examples are surprisingly varied in their surface color and distribution of light and dark. Some of them vividly suggest oriental block prints.

Just when the first book of these prints appeared is not known. The idea is simple enough to have occurred to anyone. The actual process, however, has its difficulties. Most inks are too fluid; mineral inks are too hard; water colors or vegetable juices will not mix with oil. In a little volume by Ernst Wilhelm Martius: "Neuste Anweisung, Pflanzen der Leben abzudruken" (1785), the complete process of making the print is described. Martius wrote fifty years after the process had come into general use. He refers especially to the "Offizinal Kräuterbuch" of Johann Hieronymus Kniphof (1733) and quotes from F. E. Brueckmann's "Die Art, Kräuter nach dem Leben abzudruken," of the same date, and regards these two botanists as the first to take the method of nature-printing seriously. Martius experimented with many inks and dyes and found that only a mixture of soot and linseed oil would give satisfactory results. A certain consistency was essential to prevent the mixture from flowing too freely, smearing, or drying too fast. Soft paper was used for the impression, to absorb some of the oil. A green dye was occasionally used, made chiefly from "Spangrün," but gave a rather weak impression. In one volume the green has been mixed with the lamp-black, the particles of either lying distinct on the paper and creating a very pleasing soft color. Not dried, but fresh, specimens were recommended, because they held the ink better and registered every detail. All surface moisture on the plant had to be removed. The subject was then carefully pressed in folded paper between blotters, painted carefully, and applied to the printing sheet. Thin inks were used

FIGURE 4. *Adonis vernalis*, from *Herbier de la flore française* by Cusin and Ansberque.

on conspicuously veined leaves; in many examples of these, the effect is that of a skeleton leaf, the interstices standing out nearly white. Thicker inks were employed on solid areas. It was found that a smooth block of wood, inked with a viscous mixture, would serve for inking a single specimen from fifty to a hundred times. Only two or three impressions could be taken from each inking; but Martius records as many as three hundred complete transfers being made in a day. For fleshy, deeply veined leaves, such as those of Asclepias and citrons, varnish was mixed with the dye and the heavy imprint scraped over with a knife when nearly dry.

Copper-plate engraving had superseded this medium by the end of the 18th century; but that nature-printing had become recognized by botanists is evident in the number and size of numerous books employing the process which Martius lists as having been published between 1733 and 1785. A few of these are in the Garden library, notably a "Flora berolinensis" by Johann Julius Hecker (1757), consisting of two volumes containing three hundred often beautiful examples. There are Anchusas with all of the pilose quality of the stem and leaves delightfully rendered, Althaeas with velvety leaves and flower buds, Dianthus accented with slightly exaggerated stem nodes, and Argemones with their crisp pattern of toothed lobes accentuated by the imperfect running of ink to the edges. The involved design of Heracleum flowers, and the tendrils of Lathyrus stand out like lace. The plates of the little Droseras, of Galium, and of Oryza, with its waving fruit, would make artists envious. Variety is given many prints by the two-toned effect of overlapping parts.

Another work is the four-volume "Botanica in originali seu herbarium vivum" of Johann Hieronymus Kniphof (1757). These plates unfortunately have been spoiled by the addition of color, not well done, and applied with a brush. They are of miscellaneous plants arranged alphabetically; and in spite of the frequent clogging with paint, many of the subjects are surprisingly life-like. Oil has discolored the pages here and there. The best plates are those showing the complex structure of ferns and composites. One example, of a frond of *Osmunda regalis,* reveals the veining remarkably.

An "Icones plantarum officinalium ad vitam impressae" by Philipp Kaspar Junghans appeared just after Martius's treatise

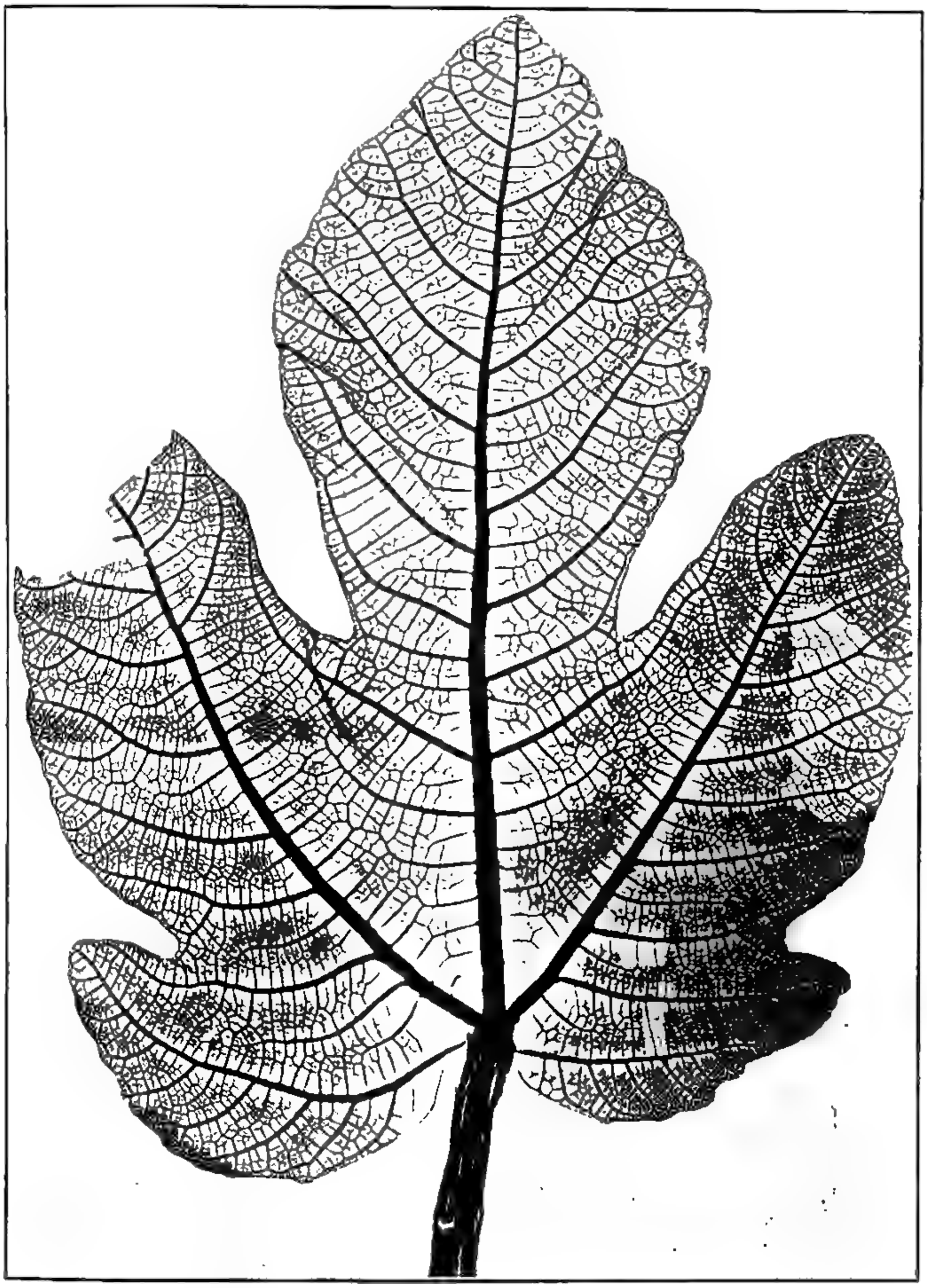

FIGURE 5. Leaf of *Ficus carica*, from Smith's *Specimens of Nature-Printing*.

FIGURE 6. *Staphylinus silvestris*, from the *Flora berolinensis* of Johann Hecker.

(1787). These plates have been so much retouched, however, as to be of negligible interest from the standpoint of nature-prints. Only the oil-stains on the reverse of the pages and the obscure outlines betray the original print. In places the true veins may be seen standing out under false and badly indicated ones.

Pritzel's "Thesaurus literaturae botanicae" lists an even dozen ambitious books of nature-prints published from 1750 to 1820. In bookshops today one may occasionally find scrapbooks of a later date containing examples of this work, usually of an amateur quality. There is nothing amateurish about the huge Victorian book in our collection: "Specimens of nature printing from unprepared plants, animals, etc., etc.," by Henry Smith, Superintendent of the Government Press in Madras (1857). The "animals" in the title apparently refers to three plates of a snake and two of a bat, which, let us hope, were "prepared" for death and immortalisation in the jaws of the press, even if the plants were not. Both subjects, as a matter of fact, are well reproduced. The remaining, botanical, plates, are nearly perfect and bring this crude period in botanical illustration to a fitting close. Smith was ambitious; he tried not only reptiles but what was doubtless more difficult—and with success except for a few smudges and smears of oil—such plants as aloes, club-mosses, laurels, giant fig and many smooth glossy leaves. Some of the prints are in pairs, showing both sides of the leaf; the rendering of grasses is especially fine.

None of these books, perhaps, has any practical value, unless it be for the study of leaf veins. They are, however, well worth examining for their historical interest and for their unique expression of floral forms in graphic ornament and design.

D. T. Walden.

A GLANCE AT CURRENT LITERATURE[1]

The June issue of *The Gardeners' Chronicle of America* has an interesting article on the origins and history of "Old-Fashioned Roses" by Francis E. Lester, praising the endurance, longevity, fragrance, and prolific bloom of the hardy teas, Noisette climbers, sweet-briars, French, and damask roses. In the same issue Cecile Hulse Matschat writes of the "Plant Pageant in Panama" (Canal Zone, Taboga Island, Barro Colorado). "Chinese Garden Subjects" by Charles W. Burr treats of Forsythia, Hamamelis, Deutzia, Viburnum, and other shrubs, with some interesting facts on commercial collecting expeditions in China. In "Plant Portraits" T. H. Everett exhibits Begonia Lady Waterloo and *Leucocoryne ixiodes,* to which latter he gives the name: Glory of the Sun.

* * * * *

Among the wealth of material in *The American Rose Manual* for 1935 is one on the roses of north Russia. Much attention is given to reports and articles on disease control; and a digest of opinion on new roses of the last five years is included. In the production of novelties, the United States, Great Britain, France, and Germany are about equally represented with 35 varieties each. This field is further discussed by J. H. Nicolas in *The American Rose Magazine* for May–June. Under the title, "Regionality of the Rose," Mr. Nicolas justifies the production of an apparently excessive number of hybrids which are introduced into commerce each year. A report is quoted from the French Rose Society, which has been conducting an annual vote on the best rose introduced in the fifth previous year. The 1934 vote for a 1929 variety went to Mrs. Pierre S. du Pont, with Talisman a close runner-up.

* * * * *

The June issue of the *Journal of Forestry* is largely concerned with the grave present problem of soil erosion. Related topics of deforestation and land reconstruction are substantially treated. An unusual paper is that entitled "Photoperiodism in Forestry," by S. R. Gevorkiantz and E. I. Roe, a study of light in relation to plant growth, morphological changes, and frost and drought resistance.

[1] All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building

Madame Lefeber, a showy new tulip of vase form and opening to nine inches across, is presented by J. H. MacFarland in the May 1st issue of *Horticulture*. The June 1st issue contains a comprehensive survey of modern tendencies in tulip hybridizing, entitled "New Tulips in Wide Variety," by Peter Van Bourgondien. The strain of *Tulipa Grullemanni*, a cross between *T. retroflexa* and the Darwin, is especially recommended. In the same issue T. H. Everett has an article on the difficult South African annuals, "Venidiums."

* * * * *

The Gardeners' Chronicle of England contains an article on "New Dahlias" by J. B. Riding, in the May 18th issue, and another on "Dahlias of Outstanding Merit" in the May 25th issue. A survey of hybridization work in lilies of many genera, from 1910 to 1935, includes a tribute to Dr. A. B. Stout of the Garden. This and subsequent issues give full reports of the Royal Horticultural Society Exhibition at Chelsea, with numerous photographs. The long editorial in the June 8th issue is a retrospect of the life, work, and literary productions of William Robinson, the well-known garden authority, who died last spring. Robinson played a major part in effecting the change of English ornamental gardening styles from the vogue of bedding plants and tender exotics back to renewed popularity of hardy perennials and a more naturalistic treatment of landscape.

NOTES, NEWS, AND COMMENT

The New York Botanical Garden has received from The Philadelphia Flower Show, Inc., a Silver Medal for its exhibition showing the origin of the principal food-plants of the world, made in Philadelphia in March. This exhibit was similar to that made by the Garden at the fall flower-show of the Horticultural Society of New York, for which a gold medal was awarded. The exhibit was described and illustrated by Director Merrill in the JOURNAL for last December.

The Sullivant Moss Society held its regular foray at the Garden on July 2nd. Mr. R. S. Williams, former president of the Society,

exhibited and discussed some of the specimens in the Garden herbarium, and Mrs. H. N. Moldenke explained her work on the Patellariaceae. The Society lunched at the Rocking Stone restaurant in the Zoölogical Park and afterward made a tour of the Botanical Garden.

Dr. G. W. Martin, Professor of Botany in the University of Iowa, and a frequent contributor to *Mycologia*, spent several days at the Garden in June just before sailing for field work in the Panama Canal Zone. Dr. Martin was planning to join Dr. Woodson, of the Missouri Botanical Garden, at Balboa, and thence to explore sections of the island and mountain areas of Panama, the Canal Zone, and the Santa Marta mountains in Colombia. The expedition will be devoted to collecting Myxomycetes and Basidiomycetes.

Dr. Marshall A. Howe, Assistant Director, attended the 40th Anniversary Field Meeting of the Vermont Botanical Club, held July 2–6 in Wardsboro and Stratton, Vermont, on and around the site of the beginnings of the Club forty years ago. Dr. Howe is one of the four surviving founders of the Club, the others being Dr. A. J. Grout, author of well-known books on bryology; Mr. W. W. Eggleston, of the Bureau of Plant Industry, U. S. Department of Agriculture, student of Crataegus, etc.; Professor L. R. Jones, of the University of Wisconsin, leader in studies of plant pathology. A deceased founder and the first president was Dr. Ezra Brainerd, President of Middlebury College, known to botanists especially through his studies of the violets.

The display planting of Hemerocallis was moved this spring from the location established two years ago to wide borders on both sides of the walk immediately northwest of the Museum Building. The new layout is as follows: on the left as we face north the first two beds contain named clonal varieties, the third contains first generation hybrids. The two beds on the right contain species and wild types, indicating the ancestry of modern forms.

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A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

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The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. Applications for membership are always welcome. The classes of membership are:

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JOURNAL
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THE NEW YORK BOTANICAL GARDEN

FERNS OF THE SOUTHEASTERN FLORA
JOHN K. SMALL

DR. HOWE ELECTED DIRECTOR OF THE GARDEN

SOME HINTS ON NATURE PHOTOGRAPHY
FLEDA GRIFFITH

THE NIEDENZU COLLECTION
E. D. MERRILL

BOOK REVIEWS
H. N. MOLDENKE
D. T. WALDEN

A GLANCE AT CURRENT LITERATURE

NOTES, NEWS, AND COMMENT

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JOURNAL
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FERNS OF THE SOUTHEASTERN FLORA

The southeastern corner of the United States was the first part of the New World mainland to attract the adventurer and the investigator. The lust for gold and silver was the chief incentive. However, among the hordes of early expeditioners were a few who observed generally or were interested in other things. The wealth of novel vegetation could not escape attention and attempts at description. Thus, early records of the plants of the Coastal Plain resulted, even though these were more or less indefinite. After the mass expeditionary period had come to an end, the individualist period began, with the usual better and more abundant results.

Although botany in North America was cradled in the far southeast, it reached maturity in the northeast. Only when the individual collectors traversed the southeastern region, the botanical pioneers from Great Britain and the Continent, from the American colonies and later from the States, did the true nature and magnitude of its flora become manifest. As a result of the evidence gathered by these pioneers and by subsequent collectors and students, the ferns of the southeastern flora are now generally well understood. The low rolling country, more easy of access, yielded its genera and species earliest; the rugged mountains, for the most part difficult of access, yielded next. The part with least relief, but latest to be populated by the white man, peninsular Florida, yielded last, and its harvest was large.

On the following pages certain data are given largely to direct attention to districts and localities that should be further investi-

gated for ferns. The present study has emphasized the fact that after several centuries of sporadic and desultory fern-collecting and study, we know very little about the details of fern distribution and physiographic relationships.

A region in the eastern United States made up geologically of the oldest and the newest formations, with several intermediate ones, is bound both to harbor a large number of plants and to reflect interesting problems in all groups of plants. The area involved is relatively not large, but the great age of a considerable part of it, the altitudinal vacillation in that past geologic time, and the vast expanse of very recent formations result in an extensive flora and complicated floristics in various branches of the plant kingdom.

The problems of an ancient plant group—the Pteridophyta, ferns and fern-allies—as this is developed in the region under consideration, are very intriguing. The present article is the result, in part, of the writer's studies in the ferns[1] of eastern North America during a half century.

When any one, even a botanist, speaks of the southeastern United States, he usually does not realize that he is considering not only the most densely populated plant area in North America, but also the most ferny one. From fern-clad mountain peaks over 6000 feet high down to still more extensively fern-clad hammocks, swamps, marshes, and ponds at or near sea-level as well as all kinds of rock exposures, there are afforded altitudes and habitats suitable for almost any genus or species of fern capable of growing in eastern North America. The diversity and number of the ferns from the States south of the Virginia-Kentucky line and east of the Mississippi River that are represented in the larger herbaria is evidence of the truth of this observation.

The boreal region of the Southeast (southern mountains, Blue Ridge in particular) and the tropical (southern Florida) contribute to the list many ferns that naturally are lacking from the intermediate altitudes. Reference to the lists on the following pages will demonstrate the validity of the above statements.

[1] In this article the word fern is used in a broad sense to cover the groups of fern-allies as well as the true ferns.

FIGURE 1. The shoe-string fern, *Vittaria lineata,* in the Deering Hammock, Dade County, Florida. This is an epiphyte and shows the simplest form of a true fern-leaf—a simple, elongate leaf resembling a shoe-string.

There were at least two major plant reservoirs which supplied the ancestors of the ferns that now populate the southeastern United States: First, the crest of the Blue Ridge, which held vegetation in reserve when a large part of the southeast was submerged under the sea; Second, the Caribbean islands lying south of the continental shelf upon which peninsular Florida now stands, which held vegetation in reserve for Florida after its relatively recent elevation above the sea.

The nomenclatural (though scarcely the taxonomic) foundation in fern literature of the present work is the "Species Plantarum" of Linnaeus, published in 1753. This early treatment of the ferns is, of course, incomplete in the matter of both genera and species and is also decidedly unorganized. Indeed, Linnaeus[2] knew of but 49 of our 152 species of native ferns. He grouped them under twelve ill-defined generic headings. Moreover, Linnaeus knew comparatively few of these 49 species from the region under consideration, his plants and information having come mainly from insular and continental tropical America. It was subsequent exploration that discovered the many tropical American species this side of the Gulf Stream.

The following list shows the Linnaean interpretation of our fern-plants, and also their present-day generic equivalents:

---

[2] Carl Linnaeus was born 13/14 May, 1707, at Rashult, Smoland, Sweden. His interest in botany dated from his youth. At twenty he began his university studies at Lund, going to Upsala in the following year. In 1732 he traveled in Lapland, under the auspices of the Upsala Academy, and during the next few years visited various parts of Sweden, Denmark, Germany, Holland, and England. In 1735 he received the degree of doctor of medicine in Holland, and made his home in that country for several years. It was while there that he published the details of his artificial "sexual system" of plant classification, which soon made his reputation world-wide, and was used exclusively by nearly all botanists for almost a hundred years. In 1738 he returned to Sweden, and became a practising physician in Stockholm; from 1741 he was a professor in the University of Upsala, where he remained until his death, 10 January, 1778, publishing meanwhile numerous works, botanical and zoölogical; the most famous is his "Species Plantarum," 1753, which is now accepted as the starting-point of modern botanical nomenclature.

—John Hendley Barnhart

Onoclea sensibilis L. .....
Ophioglossum vulgatum L. .....
Ophioglossum palmatum L. = Cheiroglossa palmata (L.) Presl.
Osmunda virginiana L. = Botrychium virginianum (L.) Sw.
Osmunda regalis L. .....
Osmunda cinnamomea L. .....
Osmunda adiantifolia L. = Anemia adiantifolia (L.) Sw.
Acrostichum polypodioides L. = Marginaria polypodioides (L.) Tides.
Acrostichum areolatum L. = Lorinseria areolata (L.) Presl.
Acrostichum platyneuron L. = Asplenium platyneuron (L.) Oakes.
Acrostichum ilvense L. = Woodsia ilvensis (L.) R. Br.
Acrostichum Thelypteris L. = Dryopteris Thelpyteris (L.) A. Gray.
Pteris lanceolata L. = Paltonium lanceolatum (L.) Presl.
Pteris caudata L. .....
Pteris lineata L. = Vittaria lineata (L.) J. E. Smith.
Pteris atropurpurea L. = Pellaea atropurpurea (L.) Link.
Blechnum occidentale L. .....
Lonchites repens L. = Hypolepis repens (L.) Link.
Asplenium rhizophylla L. = Camptosorus rhizophyllus (L.) Link.
Asplenium Scolopendrium L. = Phyllitis Scolopendrium (L.) Newm.
Asplenium serratum L. .....
Asplenium Trichomanes L. .....
Asplenium dentatum L. = Asplenium dentatum L.
Polypodium heterophyllum L. = Phymatodes heterophyllum (L.) Small.
Polypodium Phyllitidis L. = Campyloneurum Phyllitidis (L.) Presl.
Polypodium virginianum L. .....
Polypodium pectinatum L. .....
Polypodium aureum L. = Phlebodium aureum (L.) R. Br.
Polypodium Phegopteris L. = Dryopteris Phegopteris (L.) Underw.
Polypodium noveboracensis L. = D. noveboracensis (L.) A. Gray.
Polypodium marginale L. = Dryopteris marginalis (L.) A. Gray.
Polypodium fragile L. = Cystopteris fragilis (L.) Bernh.
Polypodium bulbiferum L. = Cystopteris bulbifera (L.) Bernh.
Polypodium Dryopteris L. = Dryopteris Dryopteris (L.) Fée.
Adiantum pedatum L. .....
Adiantum Capillus-Veneris L. .....
Adiantum clavatum L. = Sphenomeris clavata (L.) Maxon.
Lycopodium nudum L. = Psilotum nudum (L.) Griseb.
Lycopodium clavatum L. .....
Lycopodium rupestre L. = Selaginella rupestris (L.) Spring.
Lycopodium alopecuroides L. .....
Lycopodium Selago L. .....
Lycopodium obscurum L. .....
Lycopodium cernuum L. .....
Lycopodium carolinianum L. .....
Lycopodium apodum L. = Selaginella apoda (L.) Fernald.

After the Linnaean period many ferns and groups of ferns were removed from their earlier generic associations and classed in more natural or, at least, less complex groups. Curiously enough, after a lapse of nearly two centuries, untidy and confusing genera are still maintained in the classifications of some fern students. This uneven division of the ferns, *i.e.*, into simple or natural groups and complex or unnatural groups under generic headings, is confusing to the amateur. Accordingly, in the following notes (taxonomic treatment) an attempt has been made to refer to (interpret) the fern-plants involved in more simple or natural generic concepts.

Plant Provinces

Fortunately for the botanist, the fundamental geologic and physiographic structure of the southeast is comparatively simple. Six major plant areas are involved. They coincide with certain groups of the geologic formations. The four older areas lie in subparallel bands (Piedmont, Blue Ridge, Appalachian Valley, and Appalachian Plateaus), and are flanked by younger formations, on the east, south and southwest by the diversified Coastal Plain and also on the west by the Interior Low Plateaus.

The very early fern growth was doubtless destroyed during extensive changes in elevation of the highlands and the invasion of the sea over the lowlands.

The plant provinces comprise two main kinds of geologic formation, (a) igneous and metamorphic (recrystallized) and (b) sedimentary. Starting with the present most elevated province, the Blue Ridge, we find igneous and metamorphic rocks. The Piedmont is also composed chiefly of igneous and metamorphic rocks. The next formations, in respect to age, lie to the westward, namely, the Appalachian Valley, the Appalachian Plateaus and the Interior Low Plateaus. These are consolidated sedimentary rocks composed largely of detritus eroded from the older formations.

The oldest vegetation of our area was wholly wiped out ages ago, and so were its direct descendants. The oldest highland vegetation populated the Piedmont and the Blue Ridge whence it spread as new formations appeared. How many waves of vegetation there were we do not know. In the final adjustment we scarcely know which flora is the older—that of the Coastal Plain or that of the Appalachian and Interior Low Plateaus provinces. The begin-

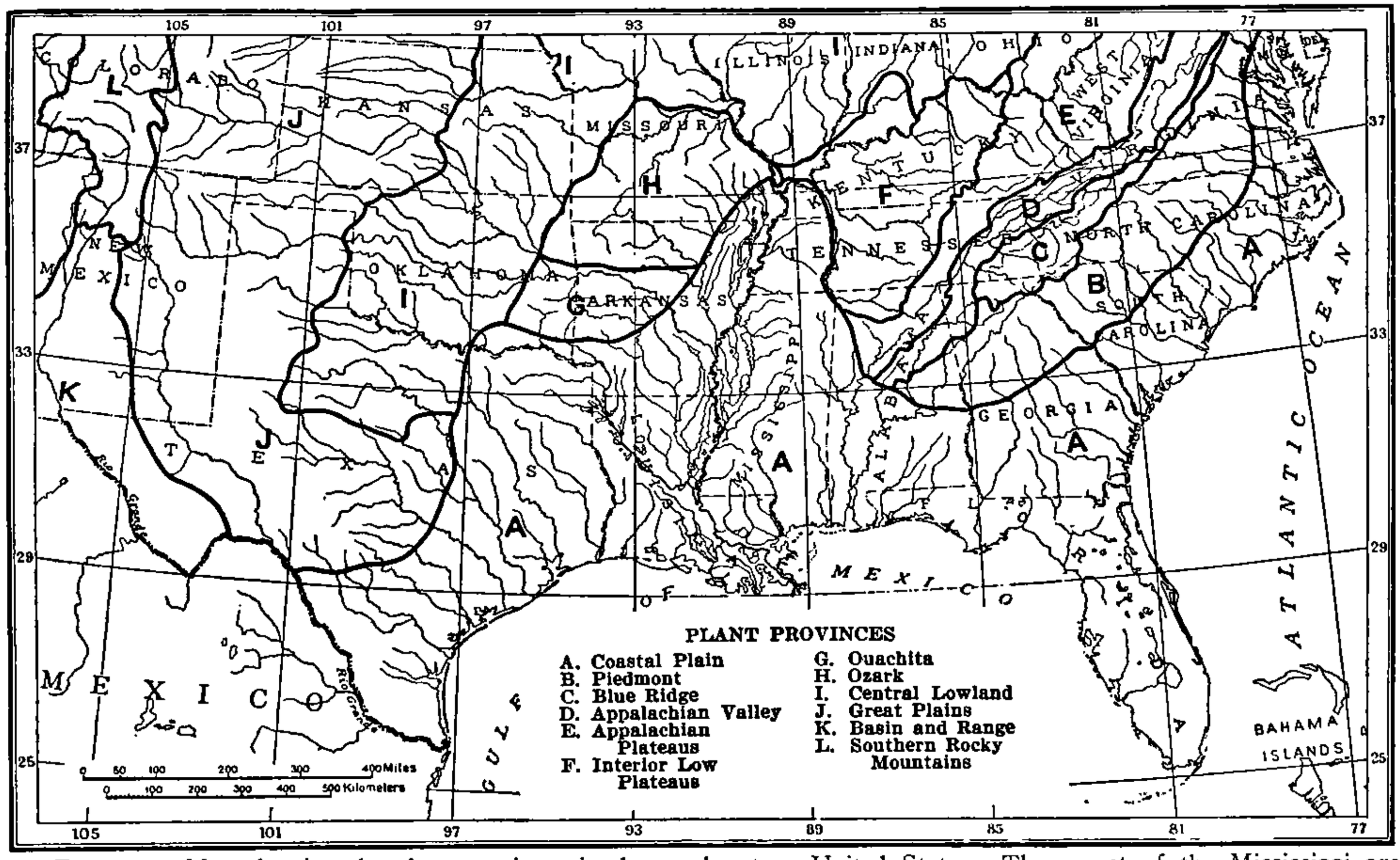

FIGURE 2. Map showing the plant provinces in the southeastern United States. Those east of the Mississippi are the ones concerned in this paper. The provinces west of the Mississippi are shown as a matter of interest, for many of the ferns in the eastern provinces are also represented in the contiguous ones westward.

nings of these floras, indeed, may have been coincident, that of the former starting with elements from the tropics, that of the latter with elements from the highlands.

Outstanding Features

Throughout our area are many minor plant regions, all interesting and some celebrated as fern localities. Watersheds and river valleys are in all of the provinces.

In the Blue Ridge are mountain ranges, ridges, and peaks, gorges, waterfalls, and high plateaus. The Blue Ridge represents the most elevated country east of the Rocky Mountains. There are many peaks over 6000 feet in altitude. According to present available figures the twin Black Brothers represent the maximum altitude, the higher peak registering 6690 feet above sea-level. Clingman's Dome is 6684 feet and Mt. Mitchell is 6642 feet. The differences in elevation furnish different fern habitats. The lower peaks are clothed with deciduous forests and their moist places are mainly along streams; the high peaks, mostly above 5000 feet, are clothed with coniferous growth and are frequently cloud-capped and consequently very moist. An instance of a fern that has found suitable localities in the Blue Ridge is the wide-spread *Woodsia scopulina.*

In the Piedmont the outstanding areas are the outcrops of igneous and metamorphic rocks. Dunn's Mountain in North Carolina and Stone Mountain in Georgia are well-known granite domes. Stone Mountain is the original and only known locality for the fern-relative *Isoetes melanospora,* and the granite region slightly eastward is the only known station for *Pilularia americana* east of the Mississippi River. Two other very prominent isolated elevations, with a maximum altitude of 1705 feet, should be mentioned, King's Mountain and Crowder's Mountain,[3] which rise out of the plain near Gastonia, North Carolina; also Kenesaw and other mountains in Georgia. The fall-line along the inner edge of the Coastal Plain has special features. Also, back of the fall-line there are deep valleys cut by the rivers, with the steep rock sides often facing north. The altitude of the Piedmont increases inland and southward, and points fully 1800 feet above sea-level are reached in North Carolina and Georgia. In North Carolina, south of the

[3] The rocky top of King's Mountain is called the Pinnacle.

FIGURE 3. The lace-fern, *Dryopteris setigera*, in a cypress-swamp near Lakeland, Florida. Contrasted with *Vittaria lineata*, this plant shows the very complex type of leaf-blades of a true fern.

town of Morganton, is a mountain range known as the South Mountains. This area, reaching a maximum elevation of 2919 feet, and containing only a few small settlements at the outer edges, is botanically unknown.

In topography the Appalachian Valley, the Appalachian Plateaus, and the Interior Low Plateaus have some things in common, but there are also unique features in each.

In the Appalachian Valley there is a series of parallel longitudinal valleys and mountain ridges, all of which result in a trellised drainage system with the larger streams running lengthwise in the valleys, and much limestone, which many ferns like. There are steep river bluffs and rock cliffs in some places. The sharp included ridges with a maximum altitude of about 3000 feet have the cliffs facing both eastward and westward. The hills in some places are rock-capped. It is near the southern end of this province that *Phyllitis Scolopendrium,* far removed from its center of abundance, first appears south of New York State.

In the Appalachian Plateau with the features of a dissected plateau there are horizontal strata and the drainage is decidedly dendritic, which helps to keep the wood and swamp ferns more evenly distributed. The escarpments permit of waterfalls, rapids, and coves. There are many cliffs, chiefly of sandstone, but locally of limestone. Gorges are also present. The varied rock-formations and various degrees of moisture form suitable habitats for rock-loving ferns. The interesting fern, *Asplenium Bradleyi,* was discovered on Walden's Ridge, at the southern end of this province. Altitudes range from 500 to 3000 feet above sea-level.

In the Interior Low Plateaus dendritic drainage also obtains. There are rich woods and swamps. In some places there are steep bluffs along the rivers. Extensive outcrops of limestone have been eroded by the action of the weather and by flowing water. Large and small caverns are also present where interesting ferns may be found. It was in this province that *Cheilanthes alabamensis* was discovered.

In the Coastal Plain, the lowest and flattest province, but very diversified in soil, the outstanding minor habitats are river-courses, springs, swamps, savannas, lakes; and major areas, such as pine-woods, deciduous woods including some hammocks, and in Florida outcrops of limestone strata in the form of cliffs, grottoes, and

caves. It is in the southern parts of this province that ferns are represented by the greatest number of genera and species.

Although there is considerable altitude in the whole southeastern area, with mountains well over 6000 feet high, as a result of the southern latitude, over two thousand miles of sea-coast, and the proximity to the tropics of parts of the region, the tropical elements are dominant in numbers.

Our record shows one hundred and eighty species of ferns and fern-allies growing naturally in the southeastern continental United States. The great majority of these are native plants. One less than a dozen are naturalized. However, these exotics have adapted themselves so well to the habitats of their native relatives and associates that in the following notes no distinction between natives and exotics need be mentioned.

Analyzing this fern-assemblage from various standpoints—latitude, longitude, moisture range, habitats, chemistry, and local distribution (plant provinces)—the following statistics, on the basis of species, may be recorded:

A. Generally distributed through the Atlantic States, ranging from Florida to the latitude of southern Canada ... ... 17 species.
B. Typically tropical ferns, mostly confined to Florida ... . . 79 species
C. Typically southern ferns, not tropical ..... . 35 species
D. Ferns with ranges intermediate between south and north extremes. 13 species.
E. Typically northern ferns, ranging from Georgia to the latitude of southern Canada .... 45 species.
F. Native ferns which also occur naturally in the Old World, Europe, Asia, or Africa . .. . 25 species.
G. Native ferns that through their natural distribution circle the globe. 13 species.
H. Aquatic ferns, either free-floating or anchored ..... 13 species.
I. Swamp, bog, and marsh ferns, not including epiphytes . ... 40 species.
J. Wood or grassland ferns, not including epiphytes ..... 93 species.
K. Epiphytic ferns, not including epipetric ferns ..... . 26 species.
L. Epipetric ferns, not including epiphytic ferns:
Inhabitant of acid rock, only or chiefly .. .. 15 species.
Inhabitants of calcareous rocks, only or chiefly . ..... 47 species.
Indifferent as to kinds of rock ... . 10 species.
M. Owing to peculiar geological features there are sand ferns represented by . ... 6 species.
N. Ferns confined to the Coastal Plain province including the tropical. 89 species.

O. Ferns confined to the Piedmont province ..... 2 species.
P. Ferns confined to the Blue Ridge province .... 6 species.
Q. Ferns confined to the Appalachian Valley province ..... 1 species.
R. Ferns confined to the southeastern flora .... 29 species.

The southeastern flora has had a long history. In its area are embraced the oldest and the youngest geologic formations. Its fern content has been derived from two main sources; a vast and productive tropical reservoir on the south and a limited temperate-boreal reservoir on the north. The accumulation of the present extensive fern population naturally was a gradual process. However, there are definite migrations indicated: several from the tropics into the lowlands, and one from the north along the highlands. The latter generously supplied the lower parts of the contiguous states with ferns until the Blue Ridge province can claim only about six species as peculiar to itself. The Antillean tropics have been even more generous with their rich store-house by making the most recent extensive geological feature of the United States—peninsular Florida—the richest fern area, both in the number of species and the number of plants, in continental North America north of Mexico. The fern assemblage of the southwest represents well over fifty per cent of that of North America north of Mexico.

JOHN K. SMALL.

DR. HOWE ELECTED DIRECTOR OF THE GARDEN

At a special meeting of the Board of Managers on July 29, Dr. Marshall Avery Howe, who has been Assistant Director of The New York Botanical Garden for the last twelve years, and editor of this JOURNAL since 1924, was elected Director. Mr. Henry de la Montagne, Jr., was made Assistant Director; and Dr. Henry Allan Gleason was made Deputy Director, in addition to his position as Head Curator. Dr. Howe has been a member of the scientific staff for thirty-four years, and has seen the Garden develop from its beginnings with the appointment of the late Dr. Nathaniel Lord Britton as the first Director-in-Chief in 1896. The change will be effective on October 1st.

SOME HINTS ON NATURE PHOTOGRAPHY

Success in photographing floral subjects with a small camera is more assured today because of recent improvements in film emulsions and in control of the print. A few years ago, when color filters were necessary, it was a discouraging business to get good nature pictures, particularly close-ups of fairly small objects. It is now possible to get panchromatic films for even the smallest cameras. These films are much faster than other kinds, and color sensitive, which means that screens are not necessary to get a good general picture, as of a garden, with all the colors rendered in their correct values—in black and white. It enables us, for the most part, to secure a fine and accurate transfer of average subjects and opens up wider possibilities in pattern and design. The ordinary verichrome film, too, is a great improvement on former types, having a fast emulsion, and being more dependable for amateur use because it will stand a wide latitude of exposure.

Knowledge of one's camera is, of course, the first essential. By experimenting and taking comparative records of light, focus, and exposure one can learn the special requirements of his instrument, its limitations as well as its possibilities, and save much time and material later on. Most people look at the subject with their own human eyes, rather than with the camera's. Studying the instrument will train one to translate the subject into terms the camera can understand and to select the purely photographic elements. When considering any object to be filmed, first take time to observe the intensity, direction, and distribution of light, the pattern as it will look in black and white, the stillness of the atmosphere, and the isolation of the subject against its background. Remember that the camera records not color, but color-values, that is, dark and light.

The question most often asked is: "How much time shall I give?" The answer is concerned less with whether the day be bright or dull than with the precise nature of the object to be filmed and its distance from the camera. Perhaps the easiest solution is to get a light-meter. There is a comparatively new one on the market, that is highly recommended. It operates by an electric cell and registers the light, a sliding scale giving the proper time-

reading for the film you are using and the focus stops you have selected. It is costly, but saves a lot of guessing and failure. Without such a meter, the time to expose a picture is a matter of judgment based on past experience and the problem in hand. And every problem again depends upon the speed of the film you are using. First you must judge the intensity of the light. Quality of sunlight varies greatly. Shade in the deep woods is very different from shade on an open lawn or behind a building. What you are photographing makes all the difference. If it is a marine scene, for example—dunes, or rock shore—where the sky and water reflect light on all sides, the intensity is extreme, and you can close your shutter down to a minimum. Unless your camera has a speed of 1/200 or even 1/500 of a second, you must also close the diaphragm way down to cut out some of the intense glare.

A general prospect, as of a large garden or bit of landscape, where all principal objects included are at least fifteen feet from the camera, can be photographed safely with the diaphragm fully open. Common sense will prescribe that parts of the picture you are specially interested in should stand out in the strongest light. (FIGURE 1.) If, however, one wants to photograph a smaller area, with some background and a more or less conspicuous foreground less than fifteen feet distant, the problem is to get sufficient depth of focus, and in order to do this one stops down the diaphragm and increases the time. For each stop give double the time. The long exposure will necessitate the use of a tripod. (FIGURE 2.)

Exposure must be adapted, not so much to the intensity of light on the particular day, as to the amount of light directly on and surrounding your immediate subject. Snow and water reflect a great deal of light; stretches of lawn, broad walks and walls, will increase the light far more than the eye may realize. It is important to train your eyes to observe gradations of light as they appear upon the surface of the object to be filmed. An unrelieved brilliance on objects near at hand is unfortunate, unless the object's surfaces are broken into rather small areas with small shadows between. For such unrelieved objects try another angle, getting the direction of light as much as possible from one side or across, instead of head-on. The object should have some play of stronger and weaker light, without spotting or violence, but enough to pro-

FIGURE 1. Distribution of sunlight and the point of interest picked out in strong light.

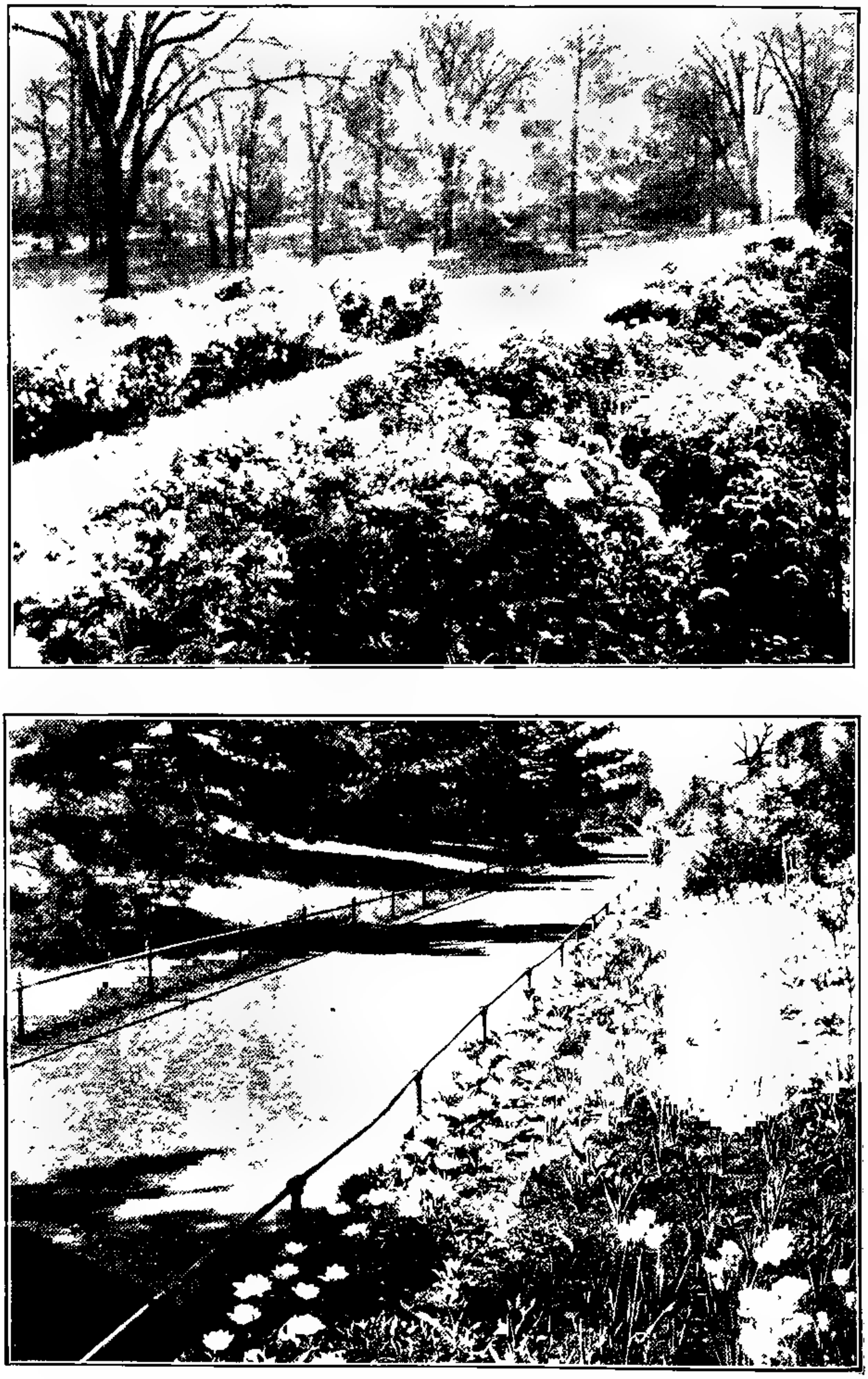

FIGURE 2. The upper shows background out of focus, insufficient exposure. The lower shows all parts in focus, diaphragm closed down, longer exposure.

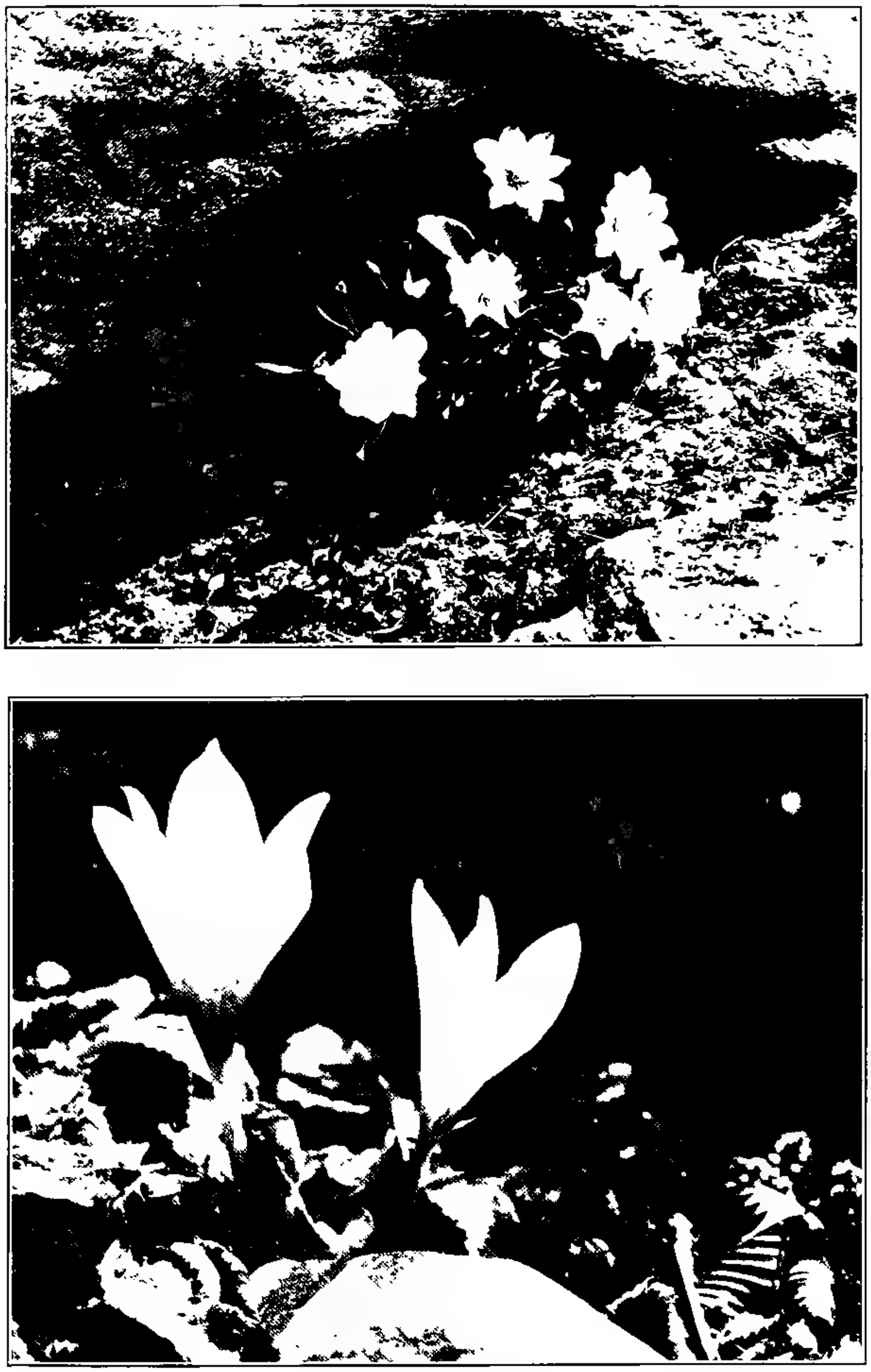

FIGURE 3. The upper shows gradations of light, depending upon selection of angle of focus. The lower shows gradations of light in a close-up, taken with an extension.

duce the effect of modelling. These gradations of light are one of the chief sources of success and a factor too often overlooked, (FIGURE 3.)

The camera records only planes. It is often impossible for it to distinguish, for example, a single tree among many, from its background; whereas the human mind corrects the true optical vision and sees the tree in relief. A mass of small leaves will tend to solidify in bright light, although the eye picks out the separate leaves in spite of the great refraction of light over the visible shadows. This overplay or running-together is more particularly to be reckoned with in early spring and summer. Everyone has observed how young leaves will register as white blurred masses on the print. Later in the year the duller foliage-textures and darker colors, and also the heavier atmosphere, lessen the amount of refraction. During bright summer weather it is perhaps wiser to take shots early or late in the day.

Once you have selected the best focus and direction for photographing your principal object, and have it in a favorable distribution of strong light values, the next step is to segregate it from the background. If darker masses predominate on its edges, see that lighter ones stand above and around it, and conversely. If the object makes a fairly bold outline find the position at which either bold masses of contrasting value or much broken and spattered patterns of dark and light surround it. Selection of the best possible angle from which to take your picture will thus be a compromise between the angle desirable for light on the subject and the angle which best sets it off and models it against the whole picture. (FIGURES 1 and 3.)

Long-range pictures, as of hills, lake shores, cliffs, will often register better, in small cameras, on days of fairly low light intensity, as long as there is some slight sunshine to give accent and definition. Bright light over distances dazzles and makes the image fade out in the camera.

Objects close at hand must have detail within themselves and demand a discriminating consideration of light gradations. Time and the stillness of atmosphere must be more seriously reckoned with here than when photographing farther objects. A tripod is indispensable; it is quite impossible for any one to hold a camera steady and sufficiently long for the time required for a close-up.

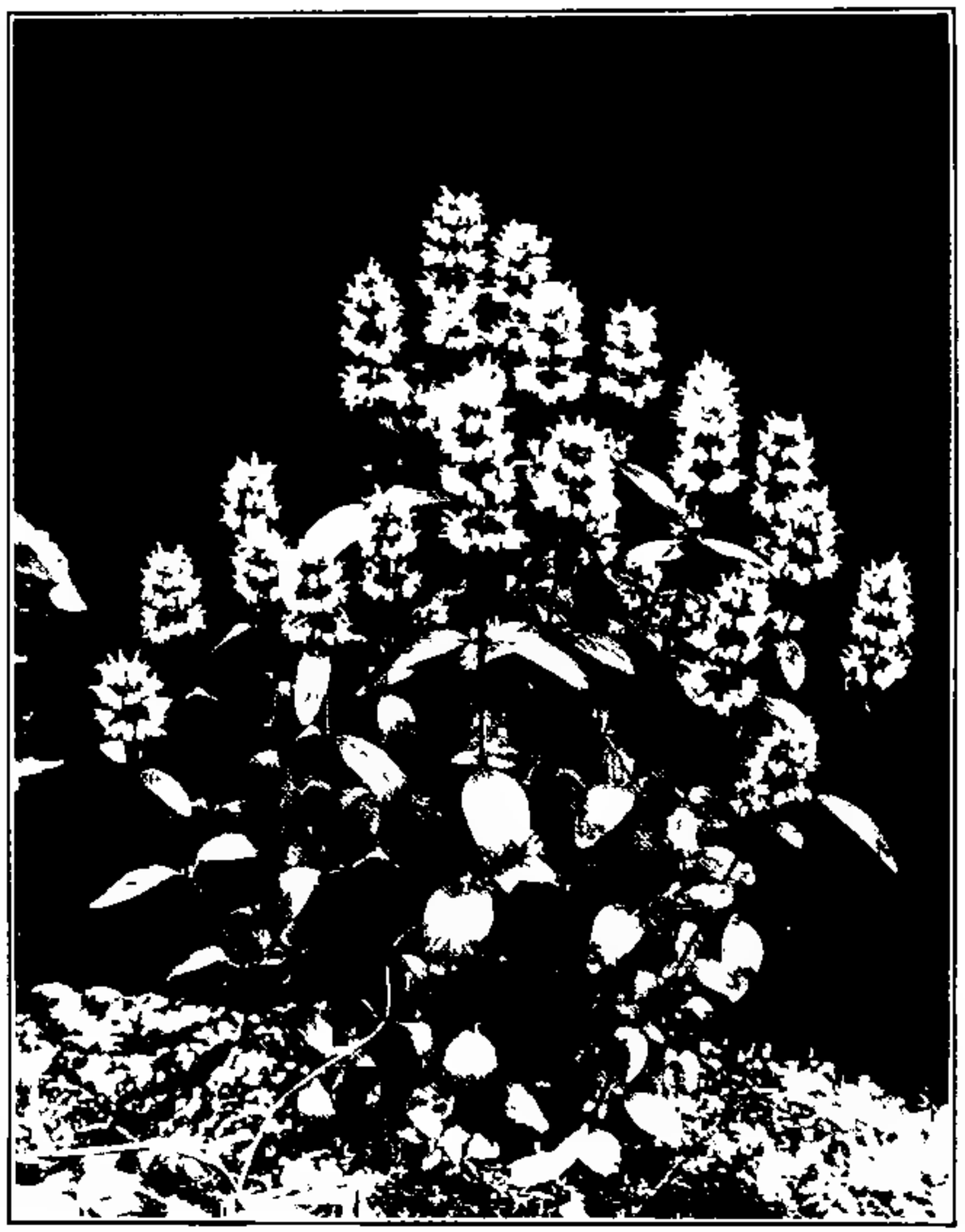

FIGURE 4. Left, Pentstemon with a natural background. Right, the same with an artificial background.

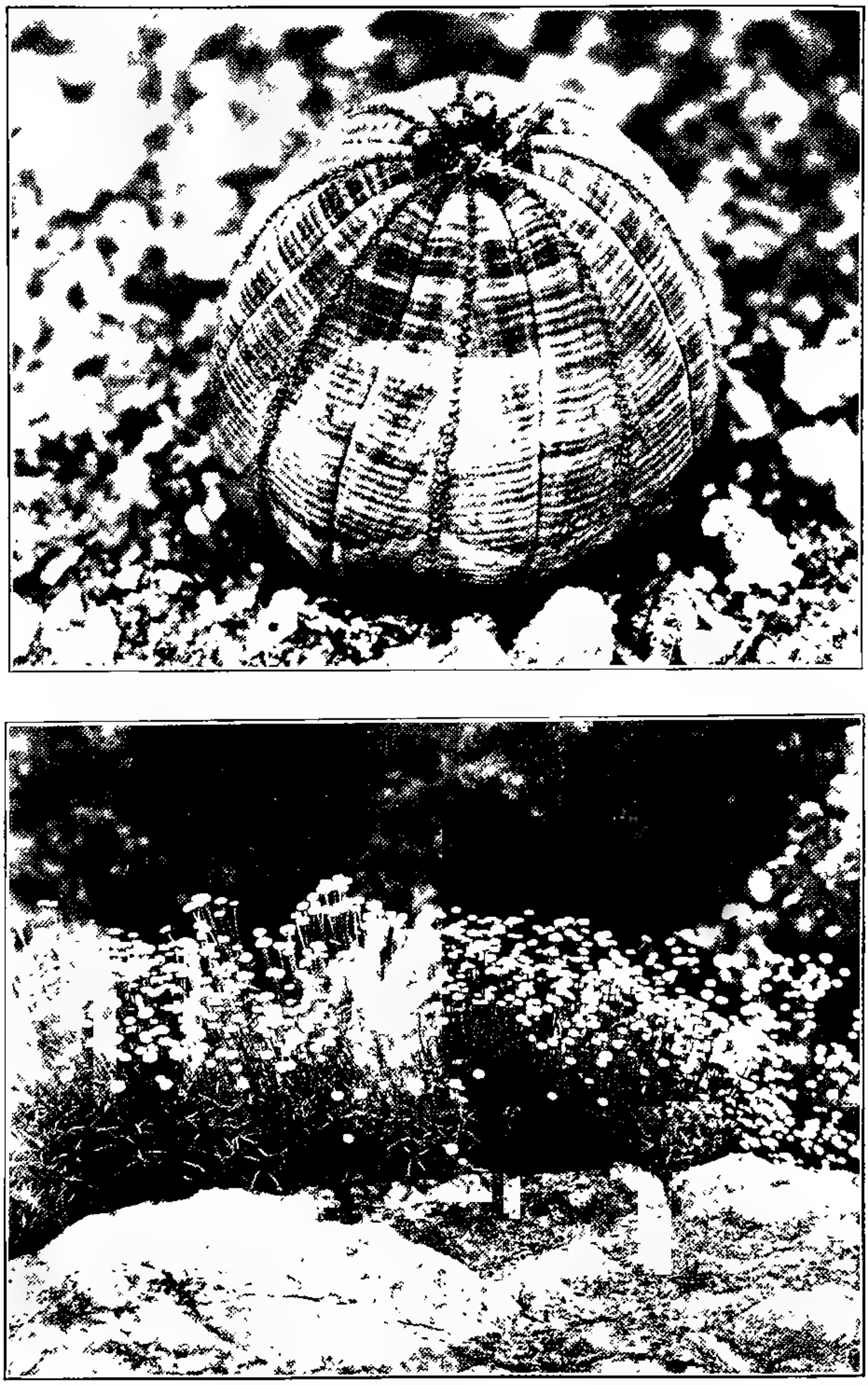

FIGURE 5. The upper shows contrast by setting background out of focus. The lower shows contrast by background both darker and out of focus.

FIGURE 6. Composition by gradation of light.

A tilting top is a great convenience and necessary for taking subjects below the level of the lens, such as flower borders and low plants. Unless you can manoeuvre the subject into a position where it is picked out in contrasts, you will have to rearrange the background artificially. (FIGURE 4.) A piece of dark gray cloth and a paler one can be carried with little trouble, and rigged up, as taut as possible, on an improvised frame of sticks. Often the actual ground will give you as much trouble as the vertical background, and the cloth will come in handy here as well. Cheesecloth is useful and unobtrusive as a mask. String will be handy for tying back interfering objects, drawing branches down to cause shadows, or introducing a bit of foreground to indicate depth. One of the best backgrounds of all is still or running water, provided, of course, the play of light is not too active upon it. There are instances where the background may be left completely out of focus. If your subject forms a solid mass, this fact can be used to advantage (FIGURE 5), but if it is a composite pattern the blurring of out-of-focus details in the rear will probably swallow up the

subjects in the foreground; and the background here will have to be corrected.

It is a pity that more amateurs do not develop and print their own negatives. The sensitive emulsions of both negatives and printing papers, and the wide range of papers available make it possible to control the contrasts of the negative and to set right minor faults.

Finally, it is well to remember that good composition, quite apart from its aesthetic interest, means the proper distribution of lights and darks and the holding of the object of interest well within the frame. Overheavy masses, irrelevant lines, will prevent you from seeing the chosen subject and making your point, and minimize the results of the attention you have given to details. Half the success, and perhaps more than half of the fun of amateur work is in the endless possibilities of getting interesting as well as sound composition.

Look through the camera; notice what it will and will not record; and then adjust your instruments and subject accordingly.

FLEDA GRIFFITH.

THE NIEDENZU COLLECTION

An important recent accession of herbarium material has been received in exchange from the Berlin Botanic Garden. This consists of the Niedenzu reference collection of Malpighiaceae; 673 numbers, mostly small specimens taken from historical collections, types, etc. This family, recently monographed by Dr. Niedenzu, is largely developed in tropical America. The accession adds authentic representations of many species to the reference collections of the Garden, and enables us to interpret more accurately Niedenzu's species concept in this particular family.

E. D. MERRILL.

BOOK REVIEWS

A Flora of the St. Lawrence Basin

The new "Flore laurentienne" by Frère Marie-Victorin[1] is a most valuable and excellent contribution to our knowledge of the vascular flora of northeastern North America. It is a complete reference work for the region to which it applies. It does not pretend to be a complete treatise on the flora of Quebec, but merely of the southern quarter of this province, comprising the St. Lawrence basin. Ungava, Gaspé, and Anticosti are not included. A bibliography of the principal botanical works and periodicals essential to all workers on the flora of Quebec is given, together with a history of botanical activity in that province and discussions of the geologic history, physiography, and climate of the region. The province of Quebec is divided into 3 phytogeographic regions, the Arctic, the Hudsonian, and the Laurentian, and the last of these is further subdivided into 3 subregions, the Bouclier Precambrian, the Appalachian, and the St. Lawrence alluvial plain. Good keys are supplied to the families, genera, and species. Several specialists were consulted in groups where they are recognized authorities —Prat in the *Gramineae,* Gates in *Oenothera,* Wiegand in *Amelanchier,* Mackenzie in *Carex,* Lloyd in *Utricularia,* Bailey in *Rubus,* and Erlanson in *Rosa.* In the opinion of the reviewer, a few other groups should have been handled by recognized specialists, notably the *Scrophulariaceae, Polemoniaceae, Vacciniaceae, Boraginaceae,* and *Crataegus.* In the *Verbenaceae* two nomenclatural errors occur. The correct name for the narrow-leaved vervain is *Verbena simplex* (not *V angustifolia*) and the nettle-leaved vervain is *Verbena urticifolia* (not *"urticaefolia"*). The accepted spelling of the English common name for the genus *Verbena* is "vervain" (not "vervein" as given by Marie-Victorin).

In general, however, the nomenclature used in this work is up to date and in accordance with the International Rules, although in some cases there is a pronounced tendency toward "lumping" in regard to families and genera. Family and generic limits, however, are largely matters of personal opinion anyway, on which taxonomists will probably always differ. The line drawings illus-

[1] Frère Marie-Victorin, D. Sc. Flore laurentienne. 917 pp., 22 maps and 2800 line drawings by Frère Alexandre, L. Sc. Imprimerie de La Salle, 949 Rue Côté, Montreal. 1935. $5.

trate every genus and almost every species and are well chosen to illustrate only the essential characters which the user of this work will need in identifying an unknown plant. The number of genera and species described and figured in the present work is as follows: pteridophytes—22 genera and 64 species; gymnosperms—8 genera and 13 species; dicotyledons—405 genera and 987 species; and monocotyledons—119 genera and 504 species. In addition 16 pteridophytes, 1 gymnosperm, 264 dicotyledons, and 68 monocotyledons occurring in other parts of Quebec are mentioned. A 14-page glossary, an explanation of the abbreviations of authors' names, and a statistical table are included in the rear of the book.

The reviewer is particularly pleased to note that Marie-Victorin has accepted the most recent discoveries regarding the identity of numerous eastern American plants formerly thought to be conspecific with European forms, but now found to be distinct. The common bracken is thus *Pteridium latiusculum* (not *aquilinum*), the lady-fern is *Athyrium angustum* (not *Filix-femina*), the rock polypody is *Polypodium virginianum* (not *vulgare*), the broad-leaved enchanter's-nightshade is *Circaea latifolia* (not *lutetiana*) and the Canadian species is *C. canadensis* (not *intermedia*), the American liverleaf is *Hepatica americana* (not *triloba*), the red-berried elder is *Sambucus pubens* (not *racemosa*), the American cranberry-tree is *Viburnum americanum*[2] (not *Opulus*), etc. The use of *Actaea pachypoda* for our common thick-pedicelled white baneberry (instead of *A. alba*) and of *Lycopodium flabelliforme* for our trailing Christmas-green (instead of *L. complanatum*) are also in accordance with most recent studies.

H. N. Moldenke.

The Beautiful and the Damned

The latest addition to the Rural Science Series is a comprehensive study of weeds and weed control by Professor Walter C. Muenscher,[1] of the New York State College of Agriculture. Though primarily a practical reference book for agriculturists, it includes much random material, and valuable statistics on the

[1] Muenscher, Walter Conrad. Weeds. 528 pp., glossary, bibliography, and index. Fully illustrated. The Macmillan Co., 1935. $6.00.

[2] Marie-Victorin is in error in his use of this binomial. *Viburnum americanum* Mill., as Dr. Blake has shown, is synonymous with *Hydrangea arborescens*. The correct name for the American cranberry-tree is *Viburnum trilobum* Marsh.

origin, distribution, and increase of those wild plants which have come to be a menace in many areas. Approximately a hundred pages are devoted to the characteristics, habits, reproduction, sources, dissemination, harmful and beneficial effects, and control, of weeds. Species injurious to lawns, pastures, hay-fields, gardens, grain fields, cranberry bogs, and rice fields are given special attention; and the comparative spread of different species in local areas is considered. The urgent need for community control in certain farming sections becomes manifest. A few instances of eradication over small areas are cited; but it is claimed that eradication on a large scale is not to be hoped for, the result of control being to permit crops to grow in spite of the pests. Clean seed, clean produce, clean machinery, and autumn plowing are the chief means of prevention. A full chapter on chemical control gives specific directions for the preparation, handling, and application of various poisons. The present cost of herbicides prevents their general use, and tilling remains the most effective method of eradication. Biological control is held to be dangerous, because a large proportion of weeds which act as hosts for fungi and food for insects have closely related species that are important crop plants.

The remainder of the book is a well-illustrated guide, with key, to the weeds of the United States, totalling 260 genera and 500 species. As one would expect, the Compositae include more species listed as noxious than any other family. The Gramineae are represented by half as many (50) species, and the Cruciferae by 37. The dodders have been declared noxious by the seed laws of 42 state, the Canada thistle by 37, and the quack-grass by 34. An interesting feature of this section is the large number of local common names assigned to each species.

The author can not find much to say in favor of these prolific plants. He thinks little of the use of weeds for covering eroded areas, when desirable grasses are available. He states that plowing under only restores the nutrient elements taken from the soil by the weeds and does not add to the fertility, overlooking the fact that without weeds such fallow land would not remain fertile. He credits the weeds with providing food for birds, and takes pains to tabulate those species having (a surely negligible) medicinal use. He is completely blind to the most obvious benefit of weeds: their amazing power to heal the earth's scars, to transform the refuse heaps, railroad embankments, and burnt-over lands.

D. T. Walden.

A GLANCE AT CURRENT LITERATURE

Discussion of erosion and related problems of the soil continues to occupy a conspicuous place in periodicals. The editorial of the June issue of the *Experiment Station Record* of the U. S. Dept. of Agriculture describes the creation of the Government Soil Conservation Service and summarizes the present situation. 50,000,000 acres of land have been totally destroyed for crop production, another 125,000,000 acres have lost all top soil, and 100,000,000 acres are rapidly approaching that condition. *The Journal of Botany, British and Foreign,* for June, has a detailed report on "Reservoir Vegetation during Drought" by H. S. Thompson. A. T. De'Sigmond, in *Soil Science* for June, traces the "Development of Soil Science," from its beginning in the early 18th century, with an introduction on the theories of the ancients. In the same issue Hendrick Landegardh treats of "Influence of the Soil upon Growth of the Plant," with interesting graphs.

* * * *

In the April–June number of *The Fern Journal* C. A. Weatherby begins "A List of Varieties and Forms of the Ferns of Eastern North America." When completed this should prove a concise reference list for fern students. It includes geographic varieties and sporadic forms and indicates the source of the original description. Aberrants of commoner species of Botrychium are considered in this first tabulation.

* * * *

Some outstanding popular garden articles are "When the Desert Blooms," with excellent pictures, by Will C. Barnes, "Rose Hard Times in July," by J. H. McFarland, in the July *Flower Grower,* "Herbs for Crevice Planting," by Helen N. Webster, "Color in the Iris Garden," by Thurlow Weed, and "Zinnias Which Cover a Wide Range" (unsigned) in the June 15th *Horticulture.*

* * * *

"Cellophane and Waxed Paper Wrappers for Storing Cucumbers," by L. R. Hawthorn, is reprinted in pamphlet form from the Proceedings of the American Society for Horticultural Science. Experiment showed that cucumbers storted in moisture-proof cellophane retained their flavor and appearance for 30 days as com-

pared to less than 8 days for fruit stored in any other wrapper. The loss of weight was greatly retarded, though a small percentage of decay occurred within a given period. It is thought that cellophane wrappers may eliminate the necessity of refrigeration for transporting this popular summer vegetable.

* * * *

An article of related interest, "Iodized Wraps for the Prevention of Rotting of Fruit," by R. G. Tompkins in the *Journal of Pomology and Horticultural Science,* Vol. 12, No. 4, indicates that iodine-impregnated wraps will reduce the attack of molds on grapes and red tomatoes, on the vine, without impairment of appearance or flavor, will reduce the rotting of apples, plums, and peaches, at a sacrifice of appearance, and has no apparent effect on green-ripe tomatoes.

* * * *

Among new descriptions are two species of *Crataegus* from Missouri, by E. J. Palmer, two species of *Huodendron,* a new genus in Styracaceae, from western China, by Alfred Rehder, both reported in the *Journal of the Arnold Arboretum* for July; and a new genus, *Gamwellia,* allied to the Lotus, in Leguminosae, from Rhodesia, by E. G. Baker, in the *Journal of Botany, British and Foreign,* for June.

* * * *

A technical article of laboratory interest, "The Visible Structure of the Secondary Wall and its Significance in Physical and Chemical Investigation of Tracheary Cells and Fibers," by I. W. Bailey and Thomas Kerr, illustrated with numerous photo-micrographs, is the feature of the *Journal of the Arnold Arboretum* for July. The term secondary wall is used to designate the anisotropic layers of secondary thickening which are formed after a cell has attained its full size and shape. Another scientific paper, of more general interest, is a discussion of the distribution of pigmentation in leaves and flowers under the title "Studies in Unstable Characters in Petunia," by E. Malinowski in *Genetics* for July. The petunia was selected as an extreme flower type of the unstable race with mosaic color patterns.

NOTES, NEWS AND COMMENT

The Botanical Garden has recently received a collection of about 130 numbers (mostly 5 specimens to a number) of plants collected in Haiti and Santo Domingo in June and July of the present year by Messrs. W. Stephen Thomas and Philbrick Crouch. Of these, 68 numbers are of lichens, 34 of fungi, and 21 of seed-plants.

Dr. H. A. Gleason, Head Curator, is spending two months at the Biological Station of the University of Michigan, which is situated on the shores of Douglas Lake, about fifteen miles south of the Straits of Mackinac.

Dr. E. D. Merrill, Dr. F J. Seaver, and Dr. A. C. Smith are sailing about the middle of the month to attend the 6th International Botanical Congress at Amsterdam. Dr. Merrill will be President of the Section on Taxonomy and Nomenclature, and will represent the National Academy of Sciences, the American Association for the Advancement of Science, the Torrey Botanical Club, the New York Academy of Science, and the Bishop Museum of Honolulu. Dr. Merrill has received from Hon. William Phillips, Acting Secretary of State, an official designation as chairman of the American delegation.

Dr. Fred J. Seaver, the Managing-Editor of *Mycologia,* announces the receipt of another gift of $1,000.00, which will be added to the Mycologia Endowment Fund held by The New York Botanical Garden. This is the second gift of one thousand dollars made by the same person, the name of the donor being withheld by request. It is the hope of the Managing-Editor that when the interest on this endowment fund has reached sufficient proportions it may be used to defray the cost of special features of *Mycologia* which cannot be met by the regular income.

An item in the will of Mrs. Mary Strong Shattuck, widow of the late Albert R. Shattuck, bequeaths $10,000 to The New York Botanical Garden.

PUBLICATIONS OF

THE NEW YORK BOTANICAL GARDEN

Journal of The New York Botanical Garden, monthly, containing notes, news, and non-technical articles. Free to members of the Garden. To others, 10 cents a copy; $1.00 a year. Now in its thirty-sixth volume.

Mycologia, bimonthly, illustrated in color and otherwise; devoted to fungi, including lichens, containing technical articles and news and notes of general interest. $6.00 a year; single copies $1.25 each. Now in its twenty-seventh volume. Twenty-four Year Index volume $3.00 in paper, $3.50 in fabrikoid.

Addisonia, semi-annual, devoted exclusively to colored plates accompanied by popular descriptions of flowering plants; eight plates in each number, thirty-two in each volume. Subscription price, $10.00 a volume (two years). [Not offered in exchange.] Now in its eighteenth volume.

Bulletin of The New York Botanical Garden, containing reports of the Director-in-Chief and other official documents, and technical articles embodying results of investigations. Free to all members of the Garden; to others, $3.00 per volume. Now in its fourteenth volume.

North American Flora. Descriptions of the wild plants of North America, including Greenland, the West Indies, and Central America. Planned to be completed in 34 volumes, each to consist of four or more parts. 77 parts now issued. Subscription price, $1.50 per part; a limited number of separate parts will be sold for $2.00 each. [Not offered in exchange.]

Memoirs of The New York Botanical Garden. Price to members of the Garden, vols. I–VI, $1.50 per volume; to others, $3.00. Vol. VII, $2.50 to members; to others, $5.00. Vol. I. An Annotated Catalogue of the Flora of Montana and the Yellowstone Park, by Per Axel Rydberg. Vol. II. The Influence of Light and Darkness upon Growth and Development, by D. T. MacDougal. Vol. III. Studies of Cretaceous Coniferous Remains from Kreischerville, New York, by A. Hollick and E. C. Jeffrey. Vol. IV. Effects of the Rays of Radium on Plants, by Charles Stuart Gager. Vol. V. Flora of the Vicinity of New York, by Norman Taylor. Vol. VI. Twentieth Anniversary of The New York Botanical Garden. Vol. VII. Includes New Myxophyceae from Porto Rico, by N. L. Gardner; The Flower Behavior of Avocados, by A. B. Stout; Plants Collected in the Amazon Valley, by H. H. Rusby; and The Flora of the Saint Eugene Silts, by Arthur Hollick.

Brittonia. A series of botanical papers. Subscription price, $5.00 per volume. Now in its first volume.

Contributions from The New York Botanical Garden. A series of technical papers written by students or members of the staff, and reprinted from journals other than the above. Price, 25 cents each. $5.00 per volume. In the fourteenth volume.

Flora of the Prairies and Plains of Central North America, by P. A. Rydberg. 969 pages and 601 figures. Price, $5.50 postpaid.

Manual of the Flora of the Northern States and Canada, by Nathaniel Lord Britton. 1122 pages. Second edition, 1907. $2.50.

Flora of Bermuda, by Nathaniel Lord Britton and others. 585 pages with 494 text figures. 1918. $3.50.

A Text-book of General Lichenology, by Albert Schneider. 230 pages; 76 plates. 1897. $2.50.

Plants of the Vicinity of New York, by H. A. Gleason. 284 pages. 1935. $1.65.

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GENERAL INFORMATION

Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

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ERRATUM

ANNOUNCEMENT OF AUTUMN LECTURES AND COURSES OF STUDY

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NEW DEVELOPMENTS IN DAYLILIES[1]

The daylilies are hardy herbaceous perennials of the Lily Family. They are, so to speak, half-sisters of the true lilies and like them they possess flowers of conspicuous size, color and beauty. Most of you who are gardeners are, I am sure, familiar with the Lemon Daylily, known botanically as *Hemerocallis flava,* and the tawny or fulvous Europa Daylily, known as *Hemerocallis fulva.* These two plants represent the general characters of the group.

All plants in cultivation are either members of wild species that have been brought into culture or they have been derived as the descendants of such plants. Hence the development of any group of garden plants, such as the daylilies, involves, *1st,* the discovery of wild types which are brought into cultivation; *2nd,* the selection of chance variations which may appear and attract attention; and, *3rd,* the deliberate effort to obtain new types by hybridization and selective breeding. When a seedling daylily is obtained it may be multiplied by division to give what is called a clonal variety or a clone—spelled c-l-o-n-e. All members of a clone are merely branches of one original seedling. The clone is a unit of plant life especially important in horticultural practices and the distinction between a clonal variety and a true variety, all members of which are grown from seed, is fundamental. The development of horticultural clones of daylilies, as for many other peren-

[1] From a radio talk given over Station WOR on July 12, 1935, as a part of The New York Botanical Garden's contribution to the programs of the Radio Garden Club, under the general direction of the Extension Service of the New Jersey State College of Agriculture, Rutgers University.

nials, consists in obtaining seedlings of merit which are then multiplied by division.

To understand the development of the cultivated daylilies, it is necessary to recall the introduction of the wild types. The native home of the daylilies is in the temperate regions of Asia—chiefly in Japan, China, and Siberia. It happens that two daylilies had already been taken from the Orient into Europe for culture as medicinal plants and as garden subjects at the time when the first books were written about such plants—about 350 years ago. One of these is the Lemon Daylily; the other is the fulvous Europa Daylily. These two have been propagated continuously by division and hence the many thousands of plants of each of these two types which now exist are branches of a clone that is at least four centuries old. This is a remarkable and unusual record, which attests the vigor, the hardiness, and the immunity to disease which characterize the daylilies as a group and contribute greatly to their value as garden plants.

From time to time other types of daylilies were brought from the Orient to Europe and America until now at least fifteen distinct species are to be recognized. There is in these types a wide diversity in respect to stature of plants, habit of growth, season of flowering, and in the color, the size, and the form of the flowers. In stature there is a range from about a foot in height to seven feet tall. The flowering season extends from May until heavy freezes in October. The colors of the flowers include yellow and orange in clear colors and orange in combination with fulvous red. These wild types provide excellent material for hybridization and selective breeding. It is certain that other wild types remain in the Orient to be discovered, introduced into culture, and used in hybridizations in the further improvement of the group.

It is to be noted that almost no improvement of daylilies has occurred in the Orient. One interesting horticultural type which has double flowers has long been known in both Japan and China. Certain types have been cultivated in China because the flowers are used as food, which is deservedly regarded as a delicacy. But only a few of the hybrid daylilies now grown as garden clones originated in the Orient.

In Europe the production of the horticultural daylilies began

FLOWERS OF THE BAGDAD DAYLILY

FIGURE 1. In the flowers of the Bagdad Daylily shades of orange, fulvous red, and madder-brown combine to give a pattern that is attractive and pleasing.

about 1890. Several species were being grown side by side in gardens and a few accidental hybrids appeared. Then it occurred to the now well-known horticulturist, Mr. George Yeld, who is still living, that the species of daylilies might be good subjects for hybridization and breeding. Most of the hybrids of that early date involve the Lemon Daylily and the two semi-dwarf species *Hemerocallis Dumortierii* and *Hemerocallis Middendorffii*. Some of these hybrids are excellent and will probably never be surpassed for their own respective classes. Of these Estmere, Apricot, Sovereign, Gold Dust, and Tangerine may be mentioned. These clones are semi-dwarf; they bloom in May and early June; the flower colors are yellow or orange. Soon several new species, *Hemerocallis Thunbergii*, *H. aurantiaca*, and *H. citrina* were introduced and these further stimulated deliberate hybridization.

Seedlings continued to appear either as chance hybrids or as the product of breeding endeavor until in 1925—after a period of about 35 years—about 100 such plants had been named as horti-

cultural clones, and to some extent most of these were propagated by nurserymen and grown in flower gardens. Some of these types, as Luteola, Aureole, and Florham, bloom in late June and July and were welcome additions to the group of garden daylilies.

During the past ten years the interest in daylilies has greatly increased and more attention has been paid to the growing of seedlings. As a result another 100 horticultural clones have been named and at least one thousand seedlings of merit have come into existence from which selections are being made for introduction in the near future.

How shall we evaluate the 200 clones of daylilies that have now been named for garden culture? Many are of no special merit and need not be considered for culture. In the development of any group of garden plants certain seedlings are likely to be named and introduced by persons who know too few types and who have few seedlings from which to make selections. This has been and still is the case for daylilies. Some of the daylilies which would be rated high are very similar to each other. A critical evaluation of all the daylilies now in the nursery trade would probably recognize twenty-five or thirty clones that are both excellent and distinctive. In fact daylilies have become so diverse that this number of clones may be selected without close duplication of type and character. In stature there is a range from semi-dwarf plants that stand about two feet tall to robust types six feet tall. In the extreme habits of growth there are drooping foliage and flower stems and there are stiffly erect foliage and scapes. There are clones that are strictly day-blooming, clones that bloom chiefly at night, and others whose individual flowers last for two days. In respect to the season of flowering a selection can be made which will provide succession of flowers from the middle of May until late in August. In respect to colors there is a wide range in the shades of yellow and orange, both in clear colors and in combination with fulvous red. In some of the clones recently introduced, as in Mikado Daylily, there is a conspicuous blotch of dark mahogany-red in the midsection of each petal. There is also much diversity in the fragrance, form, size, and shape of the flowers.

I am certain that very few of you who are listening to me have seen the 25 or 30 daylilies that represent the range of excellent hor-

ticultural types. You may wish to ask how you may become acquainted with them. There is descriptive literature in popular horticultural and botanical publications and there are the catalogs of nurserymen. But it is always a wise procedure to see a living plant of any kind before it is obtained for one's own garden. Daylilies may be seen in various nurseries; the newer and better ones are being grown more widely in private gardens; and special collections are being assembled in public displays in various parts of the United States.

The most complete collection of species, horticultural clones, and seedlings in existence has been assembled at The New York Botanical Garden. Here are representatives of the known species, various wild types thus far unnamed, and all the horticultural clones that it has been possible to obtain. Special effort is made to obtain the new clones as soon as they are offered to the trade either in Europe or in America. Gardeners and nurserymen may visit this public display collection to observe and to compare the various daylilies and to make their own decisions regarding the relative merits of the selections that seem most desirable for culture.

There are also at The New York Botanical Garden about 10,000 seedlings of recent breeding and some 500 seedlings that have been considered as the best among 50,000 seedlings grown during the past 20 years. These are being critically studied and compared and the ones that are judged most excellent and distinctive will be named for propagation by nurserymen. Gardeners and especially those who are interested in daylilies are cordially invited to inspect the collection. These plants include many distinctly new types of horticultural interest which indicate what the daylilies of the immediate future will be. There are always numerous plants in flower at any time from early May until late in autumn.

The Garden Club of America has recently adopted a plan for a five-year study of the daylilies. Collections of the horticultural clones will be assembled in various gardens for critical comparison and evaluation. The results of these studies and tests will no doubt be of value in acquainting the general gardening public with the merits of the daylilies.

Most of the horticultural varieties developed in recent years are the results of several generations of breeding. As new types

of wild species were obtained, the possibilities have been expanded; and each clone, finally selected and christened, represents years of experiment.

Some report may be of interest concerning the newest developments in the breeding of daylilies and for this a few projects may be reported which illustrate what is being obtained and how the results are accomplished.

There is a dwarf species scarcely a foot tall called *Hemerocallis nana* which grows wild in southwestern China. It would seem that this plant would be a valuable subject for rock gardens but it has not thrived under culture. This species was hybridized with a dwarf clone of the fully hardy *Hemerocallis Dumortierii* and hardy dwarf hybrids have been obtained that promise to be excellent plants for gardens. Further selective breeding is in progress which aims to diversify this dwarf group in respect to color, size, and form of flowers, to increase the number of flowers and to extend the season of blooming.

To cite another case, certain plants obtained a few years ago from the wild in China proved to be a distinctly new type of daylily. The flowers are small, the flower stems much branched, and the season of flowering is in autumn. This species was named *Hemerocallis multiflora.* Plants of this late-flowering daylily were hybridized with nearly all of the other species and several thousand seedlings were obtained which give a wide range in form, size, and color of flowers. In the vicinity of New York this species and its hybrids extend the season of flowering for daylilies throughout August, September, and October.

A few plants obtained from north central China are to be classed in the species *Hemerocallis fulva.* But they differ from the known types of this species in having flowers of bright rosy pink colors. These plants were used in selective breeding and in hybridizations and seedlings were obtained which have sprightly and even brilliant flower colors including shades of attractive rosy pink.

To illustrate the results possible in selective breeding from the old types of daylilies, mention may be made of the origin of the Theron Daylily which has flowers of a dark mahogany-red color that approaches purplish black. This plant has in its ancestry the old familiar fulvous Europa Daylily, the pale fulvous *Hemerocallis aurantiaca,* and certain yellow-flowered types. The first

FLOWERS OF THE RAJAH DAYLILY

FIGURE 2. The color pattern is conspicuously eyed in a garnet-brown with blades of English red, traversed by darker-colored veins, and the throat is greenish orange. The colors differ from those of the Mikado daylily.

two generations of seedlings obtained were as a rule paler than the Europa Daylily. But selections were made for both the intensity and the area of the red pigmentation. After five generations of such selective breeding plants were obtained which have the entire flower area outside of the throat deeply and richly colored with dark red pigments. The most attractive and distinctive of these seedlings was named Theron. Thus a new garden class was developed from the old types.

These four cases are representative of the various projects in the production of new horticultural types of daylilies by hybridization and selective breeding.

The nursery trade has taken an increasing interest in daylilies. Various dealers in the United States are now propagating certain of the older clones and there is considerable stock of some of these. The newer clones are also propagated but for most of these the

supply of plants is limited. A rather large number of the very best of the seedlings recently developed—such as the dwarfs, the autumn-flowering types, and those with the dark red and the rosy pink flowers—now exist in single plants or as a few divisions and it will necessarily be several years before they can be made available.

Daylilies have always ranked among the most *dependable* of garden plants. For hardiness, vigor of growth, ease of culture, and freedom from disease they are unsurpassed. A daylily is a sturdy and permanent feature in the garden. Wide and pleasing diversity has now been added to dependability. There are now many classes of horticultural daylilies which are quite as sturdy as the parent species and surpass most of the older types as garden plants of charm. Today the daylilies are to be ranked among the most desirable of herbaceous perennials.

* * * *

In addition to the radio broadcast printed above, a few statements may be made regarding the objectives and the scope of this research with the genus *Hemerocallis*. In the sequence of their conception the main aims may be stated as follows:

(1) *The study of sterilities* and especially of the self- and cross-incompatibilities which operate within species. This involves experimental tests and cytological studies in the laboratory. Several other types of sterility are found in the daylilies and these are also being studied.

(2) *The botanical evaluation of the species.* For this phase of the study, seeds, from which plants are grown, and living plants have been obtained from various localities in the Orient. Much that is new to botanical science has been learned about the genus and two new species have already been described and used in breeding. One of these is the *Hemerocallis multiflora,* mentioned above.

(3) *The hybridization of the various species and selective breeding* in reference to (a) sterilities, (b) relationships and the origin of the species, (c) inheritance of specific characters, and (d) the development of new and improved types of value for garden culture.

Thus the research began and has been continued along somewhat technical botanical lines. But after a few years it became evident that the group of daylilies presented special opportunities for horticultural development and that the principles involved in the synthesis of new forms by hybridization and selective breeding could be determined in the production of desirable types. The

possibilties of such breeding are illustrated in the production of a new race with mahogany-red or purplish-tinted flowers of which the Theron Daylily is a selection. In this case, as in others, the records of ancestry, together with the findings of the cytological studies of the nuclear organization, are being used to analyze the hereditary basis for such noteworthy changes in flower color.

The first seedlings of promise for garden culture were obtained about fifteen years ago and reported a few years later.* It was decided then that The New York Botanical Garden could not and should not undertake to propagate these plants either for sale or general distribution. Various nurserymen in the vicinity of New York City, some of whom had favored the Garden with contributions of plants, were approached but not one of them was interested in daylilies or willing to coöperate in any way in testing and propagating the most promising seedlings. Letters were then written to more remote nurserymen. The only response came from Bertrand H. Farr, who had already accumulated a collection of daylilies and had himself obtained hybrids with the *Hemerocallis citrina* as one parent. Mr. Farr came to see the seedlings at The New York Botanical Garden and offered to coöperate in testing and selecting seedlings and to undertake the propagation and the introduction of those which finally survived critical evaluation. After due consideration by the authorities of The New York Botanical Garden this plan of procedure was adopted on the basis of exchanges for plants desired by the Garden. Mr. Farr's death came soon thereafter but the coöperation was continued by Mr. C. M. Boardman and Mr. H. G. Seyler, who had been associated with Mr. Farr and who continued the nursery which he founded. Accordingly the Farr Nursery Company has obtained more than 100 of the first-selection seedlings of *Hemerocallis* and has propagated these for comparison and evaluation. Some have been discarded, even after considerable stock had been propagated, when better seedlings in the same class were developed. No clone is named or distributed except by consent of the writer.

Recently popular interest in daylilies has greatly increased. Many requests now come to The New York Botanical Garden for plants. As far as is possible, divisions have been taken from the plants growing in the display garden to supply educational institutions with collections of species and named varieties and the Farr Nursery Company has in various cases contributed for such purposes plants of the newly named clones. A total of at least 50 nurserymen, some from remote localities in the United States have within the past few years requested plants of the newly named clones and some have asked for the very best of the latest and unnamed selections. Requests for plants have also

* New Daylilies. Jour. N. Y. Bot. Gard. **26**: 169–178. Aug. 1925.

come from many gardeners, including various members of The New York Botanical Garden. Certain persons have even asked for the most promising stock that has been developed for the breeding of new types, so that they too may undertake the same lines of breeding that are in progress at The New York Botanical Garden. All this is gratifying; but it is physically impossible to supply the plants requested. To undertake the propagations necessary for this would absorb the facilities for growing plants and especially the quota of labor available and greatly decrease the extent of the experimental and botanical research involved.

In the selections of seedlings only the very best individuals in

THE SONNY DAYLILY

FIGURE 3. The habit is excellent. The flowers are medium large, full, pale yellow and firm in texture and they are widely open for about thirty hours. The period of bloom is in late July and early August. An outstanding plant in its class.

FLOWERS OF THE DAUNTLESS DAYLILY

FIGURE 4. The colors are in pastel shades of pale yellow-orange and a midzone of pale fulvous that are subdued and delicately blended in a flower of good form and texture. The plant stands about three feet tall and the period of bloom is in July.

the various classes are kept. The rest are discarded. Recently the general quality of the seedlings has greatly improved and so some of the discarded plants have been used in naturalistic plantings in suitable locations in the Garden. Requests soon came from certain members of the Garden for some of these seedlings for similar use, and so in 1934, ten seedlings were distributed to each member of the Garden who responded to the notices sent out. For the present at least this has utilized the supply of discarded plants and there are no more available.

As a partial recognition of the support given to the Garden and

of the interest in its work the following procedure is being considered. An attempt will be made to propagate five of the best of the new seedlings representing several distinct types until there are 25 to 50 plants of each—a matter of three to five years of continuous propagation. Then notice will be sent to all members and at least one plant will be supplied to any member of The New York Botanical Garden as long as the supply will permit. Thus the members of the Garden will obtain plants which, at that time, can be obtained in no other way.

Descriptions or mention of newly named seedlings have appeared from time to time in certain publications of The New York Botanical Garden* and in other botanical and horticultural publications. Some of these clones, such as Soudan, Vesta, Cinnabar, Mikado, and Wau-Bun, are now in many gardens and also in the hands of various nurserymen.

Four of the selections which are to be distributed to the trade this autumn for the first time by the Farr Nursery Company are illustrated in the figures accompanying this article. The names given to these are Rajah, Dauntless, Bagdad, and Sonny. The photographs here reproduced with the brief descriptions indicate the outstanding characters of these new daylilies.

Other daylilies which are to be introduced soon are as follows:

The MIDAS DAYLILY. A robust plant with a clear and rich orange color in the flowers.

The PATRICIA DAYLILY. A plant slightly lower in stature than the Sonny Daylily, and also its flowers are different in shape and in shade of yellow.

The SERENADE DAYLILY. A robust plant with slender bending scapes and flowers of crinkled and wavy petals and delicate and subdued shades of pale yellow and pale fulvous.

The SUMMER MULTIFLORA HYBRIDS. About fifty almost identical sister seedlings are being propagated as a group to provide for the immediate distribution of a new class of small-flowered orange-colored daylily for midsummer flowering.

The CHENGTU DAYLILY. This is a fulvous daylily from China. It is less course, more dainty in habit of growth, and more attractive in its flower colors than any other of the fulvous daylilies thus far obtained from the Orient, with the possible exception of the *H. fulva rosea,* which is quite different in shades of color.

A. B. STOUT,
Director of the Laboratories,
THE NEW YORK BOTANICAL GARDEN.

AUGUST 15, 1935.

* See especially "Notes on New Hybrid Daylilies," in Jour. N. Y. Bot. Gard. **32**: 25–33. 1931. "The Bijou Daylily," Jour. N. Y. Bot. Gard. **33**: 1–4. 1932. "The Soudan Daylily," Jour. N. Y. Bot. Gard. **33**: 104–105. 1932.

THE RAPID GROWTH OF THE ROYAL-PALM

The fifteen native palms in the continental United States show vast differences in the rapidity or tardiness of growth. A seed may be planted and sprout, but it may take the space of an ordinary lifetime for the palm to make a trunk even of moderate height.

On the other hand there are palms of rapid growth, some of them of astonishing speed so to speak. The royal-palm—*Roystonea regia*—furnishes examples of quick growth. A definite example is given below.

This palm is native in Florida, its chief stations being in the Cape Sable region, the Ten Thousand Islands, and the Big Cypress Swamp. There were formerly a few specimens, apparently native, on the lower eastern coast of Florida, but these or their ancestors may have been introduced there by the Florida aborigines or the Seminole Indians at one time or another.

This palm is very accomodating as to habitats. It will grow on dry hillsides or in swamps where water stands during part of the year. Examples of both of the kinds of habitats may be seen in Florida. In the Cape Sable region are some Indian mounds made of marl and on them royal-palms far above the maximum water-table of the region. Relatively near-by in the Ten Thousand Islands are low hammocks little or scarcely above the mean water-table with gigantic royal-palms. These specimens are the ones with which we are here concerned.

Some years ago seeds were collected from the taller palm shown in figure 1. These palms are near the Harney River. The larger palm was over a hundred feet tall. The seeds were taken to the eastern coast and planted along the Little River in Dade County. They soon sprouted and one of the seedlings developed into the large trunk shown in figure 2. The photograph of the seedling was taken about eighteen years after the planting of that particular seed. The diameter of the trunk may be calculated by the watch, which is three inches in diameter, fastened near the base.

This palm has become exceedingly popular as a street and ornamental tree in southern Florida, not only on account of its unusual trunk and beauty of the crown, but also on account of its rapid growth.

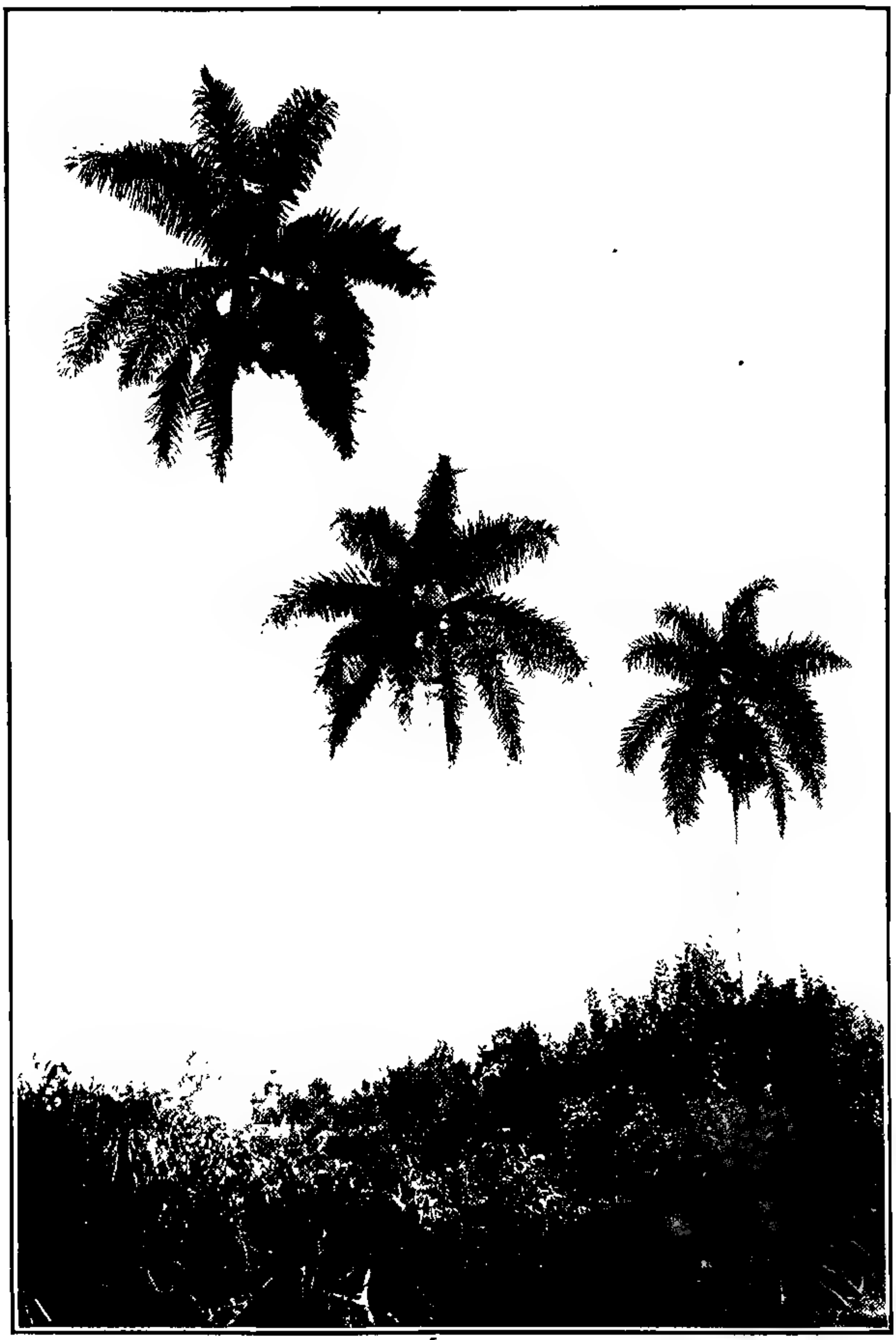

FIGURE 1. Three royal-palms—*Roystonea regia*—in a hammock on the Harney River in the Ten Thousand Islands, Florida. The tallest palm is over a hundred feet high. The trunks being about the same color as the sky are indistinct in the photograph.

FIGURE 2. The base of a royal-palm still in its teens. The specimen, about eighteen years old, was raised from seed taken from the tallest palm shown in Figure 1. The diameter of the trunk may be gauged by the three-inch watch hanging on the trunk.

The trunk consists of a very hard cylinder several inches thick and an interior of pith which is exceedingly porous and light when dry. Although the woody cylinder is comparatively thin, the tallest palms easily withstand the lashings of hurricane-winds with a velocity of over a hundred and fifty miles an hour. For an account of the royal-palm, see Journal of The New York Botanical Garden 29: 1–9, fig. 1–3. 1928.

JOHN K. SMALL.

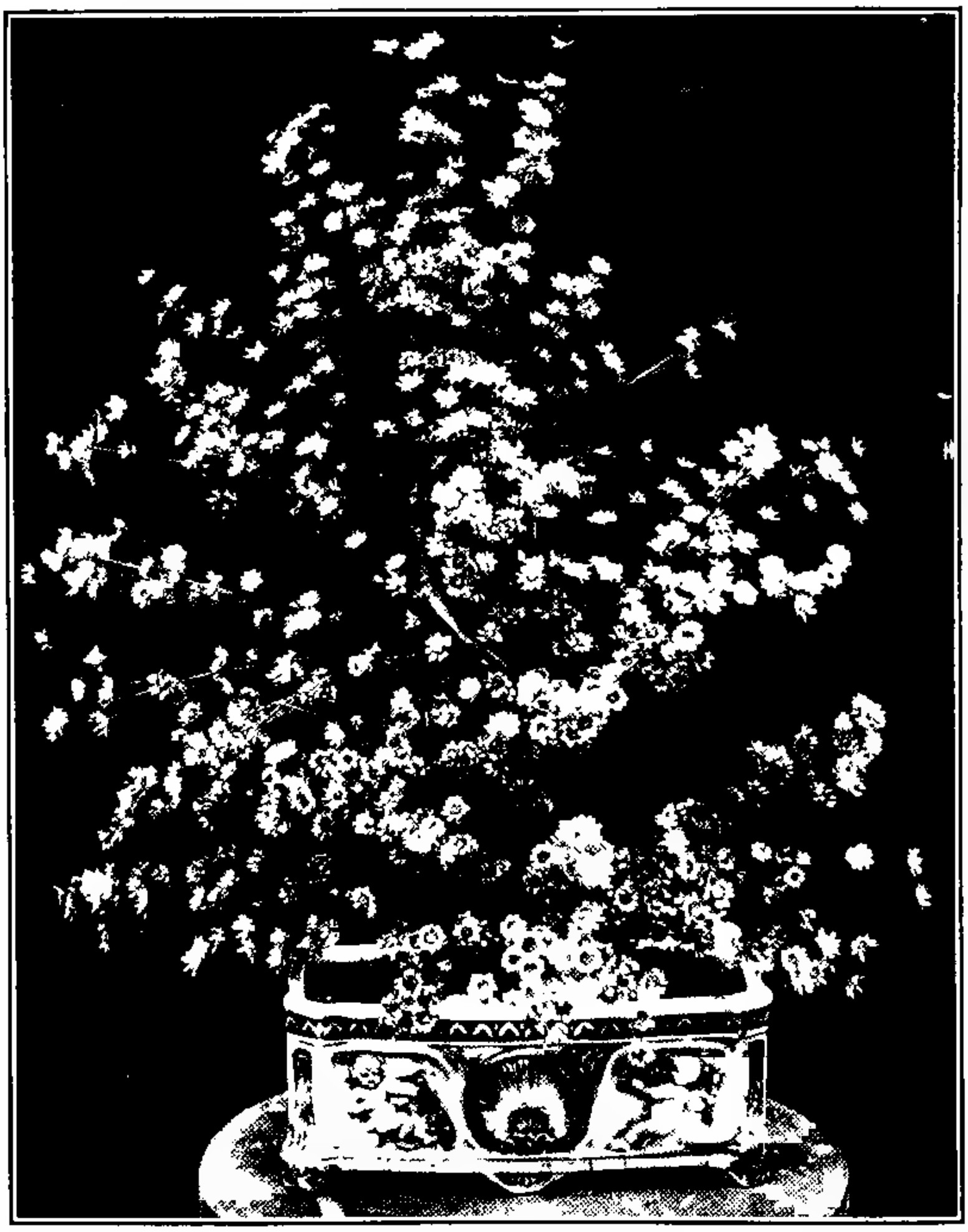

FIGURE 1. Dried and dyed *Syngonanthus elegans*, by courtesy of A. Sakelos, Florist, 110 West 86th St.

A CURIOUS DRIED DECORATIVE

About two years ago, the writer first noticed in New York florists' windows a new type of everlasting, dyed yellow, orange, rose and red. These were in clusters at the ends of branches of miniature tree ornaments in the same manner that baby's-breath (*Gypsophila*) is used.

At first look, these flowers appeared like pocket editions of the common everlasting (*Helichrysum*), on disproportionately long slender stalks, but when looked at more closely the ridged stalks became evident and then the mass of flowers in the center began to look very much unlike a composite, and finely it became evident that here was a member of the Pipewort Family, Eriocaulonaceae.

The matter was allowed to rest there without any attempt to place the plant as to genus and species as it did not seem very hopeful a problem without leaves.

Recently, however, Professor M. A. Chrysler of Rutgers University brought to the Garden a small box of dyed flowers that had been sent to him by Dreer's for identification. The specimens soon reached the writer's hands, where they were at once recognized as this same plant of two year's mystery. Some flowers were boiled and dissected, whereupon the plant was easily placed in the genus *Syngonanthus,* tribe Eulepis. Of the twelve members of that tribe, six were easily discarded by differences in head size, length of stalk, and number of stem ridges. The remaining ones were soon reduced to two, *S. niveus* and *S. elegans,* and upon resorting to herbarium specimens the following differences were found: *S. niveus* has the outer or shorter involucral bracts oblong in shape and comparatively few in number, and pale yellow or stramineous in color; *S. elegans* has the outer bracts round-ovate in shape and comparatively numerous, and light brownish-orange in color. The flower heads in hand checked perfectly with those of *S. elegans,* thus solving the mystery. Since the two species are so closely related and so alike in appearance, it is likely that both are used for the dyed material.

Both are native of southern Brazil, where *S. elegans* is very common, and is gathered in quantity and sold in bunches on city streets as everlasting ("sempreviva").

E. J. ALEXANDER.

RECENT TRENDS IN SMALL GARDENS

As a representative of The New York Botanical Garden with the group of judges in the Garden Contest sponsored by the *New York Herald Tribune,* it has been the good fortune of the undersigned to examine critically some hundreds of small suburban gardens during the past seven years. This year over one hundred gardens were examined, most of them the size of an average suburban town lot, fifty to seventy-five feet wide and about one hundred feet deep. The kind of landscape developments on these and particularly the trend shown toward new developments proved particularly interesting, both in the improvements that have been recently made and in the outstanding deficiencies which still need attention.

The most serious deficiency in most cases was in the maintenance of the lawns. Most of them were well mowed and neatly kept, but the grass in the majority of them was the annual crab grass, and good lawns of bent grass or blue grass were distinctly exceptional. Many newly sown lawns were still quite purely lawn grass, but weeds had begun to grow even in these. It was quite evident in the best lawns that they had been kept clean by careful and tedious weeding throughout the season. This is especially true of the blue-grass lawns, which even when entirely free from weeds are apt to be thin and dull at this season. In one neighborhood all of the neighbors had sown bent grass and by keeping the soil rather acid were able to avoid weeds entirely. Bent grass has a two-fold advantage. First it can stand more acid in the soil than crab grass, and second, it makes its best growth during the hot summer weather and can accordingly choke out crab grass rather effectively.

With proper control of weeds and a reasonable use of water, it appears that practically everyone in the New York suburbs may have a good lawn, and this is certainly one of the biggest assets of the suburban home. A few cases in which lawns were apparently impossible in spite of every effort were where shade trees made such a dense cover and robbed the soil so completely that the grass could not grow. In such situations one has the choice between bare ground and a covering of plants like *Pachysandra,* Periwinkle, *Ajuga reptans,* or English Ivy, all of which are very successful in

most gardens. If the situation is moist enough and sheltered from winds, ferns and other woodland plants succeed, but few of the suburban gardens visited were thus happily situated.

Next to the lawn, shrubbery and borders are among the important items in the garden picture. In most cases the shrubbery is made up of one of two kinds, either entirely of flowering deciduous shrubs, which are bare and unsightly in winter, or of dwarf conifers, which have more enduring beauty, but are rather too sedate. The use of more broad-leaved evergreens such as *Rhododendron, Leucothoë, Andromeda,* Holly, Mountain Laurel and similar plants may be strongly recommended.

In the flower border of the average small home, annuals usually predominate, with a few more vigorous perennials scattered through them and it can be more properly termed a mixed border than a strictly perennial one. Among the more popular plants which bloomed during August in the gardens are *Phlox,* the more easily grown Lilies, *Gladioli,* and a limited assortment of the more vigorous annuals, such as *Cosmos,* Zinnias, Marigolds, and Petunias. Edging plants were frequently deficient or only represented by *Portulaca,* Sweet Alyssum, or Petunias. The little *Lobelia Erinus* was in most cases a failure. In nearly all instances there was distinct room for improvement in the variety of plants grown, and particularly in selection of ones that would give a succession of bloom through the season.

Apparently the recent enthusiasm among garden writers about pools and rock gardens has affected a great proportion of our back-yard gardeners, for a very large proportion of the homes have little pools and many of these are in conjunction with a rock garden, even in situations where the soil is level and sandy and there is no natural inspiration for such a development. Most of the pools are reasonably successful as places for growing aquatics. Many of them are open to decided improvement in the art of their construction and placement. A pool resembling a bath-tub is scarcely to be regarded as a garden ornament. The rock gardens as seen in August are, most of them, rather dull and seedy-looking affairs. Perhaps one need not expect them to have much bloom at that season, though the occasional Campanulas and Gentians seen in a few of them were refreshing bits of color. But it is reasonable to

expect a rock garden, even in August, to have variety and attractiveness in its foliage, and this is a situation which might well receive the attention of rock-garden builders and writers.

Two flowers which are quite universally grown, at least through southern Long Island, are roses and *Gladioli.* The wet weather this season has made most of the roses suffer badly from black spot, many of them being nearly defoliated, while the same conditions seem to have helped the gardener to control Gladiolus thrips. The majority of more than one hundred gardens visited this year had a few *Gladiolus* plants in the flower borders, and in only one case was any thrips injury found on them. The same healthy condition in the *Gladiolus* was noted throughout the countryside on auto trips. Evidently the thrips are not nearly as destructive this year as they have been during the past three or four.

Details have been dealt with here before considering the garden as a whole, and intentionally so, for this is apparently just how the average home-owner proceeds in handling his own problems. The man or woman who undertakes to improve the outdoor surroundings of the home seems to see that neglected corner or bad spot in the lawn or bare back fence as a single unit and not as a part of the whole scheme, so the average garden is often very good in detail, the flower bed being well proportioned and the plants arranged in them effectively, both for their own growth and for variety of contour. One rather frequent fault is the mixing of too exuberant annuals with weak-growing perennials or *vice versa,* with unfortunate results in each case. Usually the annuals suffer by the combination because the perennials already have possession of the ground. While in general the details of the garden beds, shrubbery and lawns may be rather well handled, it is distinctly exceptional to find the amateur gardener looking at the home grounds as a unit. Thus most of the gardens lack any perspective at all or any attempt to create any pleasing picture of good composition. The bench or pergola may be set in the middle or in one corner of the back yard flower garden, but even with a definite focal point thus established the shrubbery and plantings are not grouped to make a most effective use of it.

Lest we look upon this whole picture as a discouraging one as seen this year, it is well to look back over the years and by com-

parison see what great strides have been made in arousing interest in gardening and securing great improvements. In the first garden contest sponsored by *The New York World,* among the thousands of suburban homes entered in the contest by hopeful owners or tenants, few had either flower gardens or foundation plantings worthy of the name. Too frequently, the only touches of color were a few scarlet Geraniums or a little patch of mixed Petunias or *Portulaca* sown in a neglected corner. During the intervening years, the picture has steadily and pleasantly changed for the better, so that now a flower garden is the rule rather than the exception in many communities. Truly, many of the older homes have not taken advantage of the recent ridiculously low prices of shrubbery and evergreens to permanently beautify their places with them. Many others might well replace old and not particularly attractive shrubs by newer and better ones, but these same people are growing healthy and well-tended flower gardens and are gradually learning the use of vines, shrubbery, and perennials in them. Here is an opportunity for educational work by and for gardeners.

FORMAN T. MCLEAN.

THE JAPANESE SHIELD FERN

Four specimens of an exotic fern have been growing for many years, unprotected, in the fern garden north of the old rockery. The number of hardy ferns native to the New York region being limited to scarcely more than a dozen satisfactory species, this foreigner should be very welcome in our gardens.

The Japanese Shield Fern, *Dryopteris erythrosora,* bears twice-pinnate broadly triangular blades 15 to 20 inches long on 10-inch dark brown and deeply grooved stipes. The rachis is colored like the stipe; and both, though smooth and brittle in appearance, are thinly covered with dark hairs. The basal and the next two pairs of pinnae are turned outward, as in the Beech ferns, and are 6 inches long × 2 inches broad at the base, tapering rapidly to an acute tip. The pinnules are rounded, very slightly toothed, and decurrent. The indusia are peltate or reniform, whitish, with a brilliant orange center. They appear close to the mid-vein, and

in two rows reaching up to within a half inch of the tip, of each pinnule. The sporangia ripen in mid-July, and by August 1st the remaining indusia are a deep grayish violet color and the exposed sori a shining black. These subsequently change to rusty brown.

The special contribution of this fern to the garden is in the bronzy variegated coloring of the young blades in May and early June. Distinct purplish and cocoa shades occur. At maturity the color has changed to a rich glossy green, showing whitish areas where the heavy sori are depressed from below. The fronds become a bit ragged after August 1st, but new ones appear at this time, of a strong claret color. Spores are borne on the majority of these later fronds, ripening in September. Through the latter part of summer the predominant color is a kind of citron-green. A good companion is the familiar Marginal Shield Fern, which seems very blue-green by contrast.

The plants in the Botanical Garden have been established for many years, and are perfectly hardy. They bear spores prolifically, but the dryness of our summer apparently prevents natural propagation. Young plants have been raised, however, in the Amateur Gardening Classes. The fronds grow from a terminal crown on a thick underground creeping stem, but there has been no increase of plants from the rhizomes.

D. T. Walden.

BOOK REVIEW

SOME AMERICAN TREES[1]

The subtitle which the author gives to this book: "An Intimate Study of Native Ohio Trees," is well descriptive of its contents. It presents an account of the trees which are found native or naturalized in Montgomery County, Ohio. Ninety-six of these are described in detail with excellent illustrations from photographs, showing their habit, bark, foliage, flower, and fruit. Eight more

[1] Werthner, William B. Some American Trees. 398 pp., profusely illustrated with photographs. Tall 8vo. The Macmillan Co. 1935. $5.00. Available in the Library of the New York Botanical Garden.

species are mentioned in the text. Fifteen immigrant trees from Asia and Europe and from other parts of the States which have become established in Montgomery County are enumerated. One of the most interesting of these is the Mahaleb Cherry, *Prunus Mahaleb,* which originally had been imported as stock for the grafting of orchard cherries and which was found naturalized along roadsides.

The descriptions given with each variety are very comprehensive and are written in an easy and entertaining style, and give a great deal of information. There are no keys for the determination of species in this book, but at the end of the description of each kind is given a summary, which the author terms "earmarks," and which outlines in a few words the distinguishing characters. These "earmarks," together with the numerous illustrations, will enable the reader to find quickly what he is looking for.

Very interesting and instructive for the lay-reader and lover of trees, for whom this book is intended, should prove also the introductory chapters, some of the captions of which read as follows: "How a tree differs from other plants," "How the seeds of trees are distributed," "American and European trees compared," "Why America has more kinds of trees than Europe," etc.

As a local tree flora the book is excellent and well deserves to be recommended to all those tree lovers who have no or little previous botanical training but wish to get better acquainted with our native trees.

H. Teuscher.

NOTES, NEWS, AND COMMENT

Mr. T. H. Everett attended the Annual Convention of the National Association of Gardeners held in Pittsburgh, Aug. 20–23. Mr. Everett spoke at the Wednesday session and delivered a report on the progress of the Student and Apprentice Gardener Training courses which were inaugurated by The New York Botanical Garden three years ago, with the support of the National Association of Gardeners.

Dr. Rafael A. Toro, Professor of Botany in the University of Porto Rico, spent some time at the Garden this summer. He is specializing in the fungi of Venezuela.

The regular summer foray of The Mycological Society of America was held at Ithaca, New York, Aug. 20–23. Dr. Bernard O. Dodge, President of the Society, attended.

Considerable interest was caused this August by the pruning of the African milk bush, *Euphorbia Tirucalli,* which has reached a height of thirty feet in the center of the display house in Range 1. Wounded twigs of the milk bush exude a poisonous sap which will cause the hands of anyone coming into contact with it to swell to twice normal size and smart acutely for several days. In spite of all precautions, Mr. Patrick Connolly, who is in charge of Range 1, and who performed a good part of the pruning, was again infected. The tree is so toxic that natives of the tropics have used its sap for blinding their enemies and as a means of destroying quantities of fish in small ponds.

Mrs. Charles Cyrus Marshall, of 2239 Tiebout Avenue, New York, President of the National Life Conservation Society, has recently conducted a nation-wide poll to select a "national tree." She reports that 2,731,062 votes were cast, of which 788,115 were for the Sequoia, 754,756 for the elm, and 666,677 for the pine. The first votes were taken among adults. This was followed by balloting in the high schools and later children of the intermediate grades were allowed to vote.

Dr. A. B. Stout attended the summer meeting of the Genetics Society of America, which was held at Woods Hole, August 23rd and 24th.

Drastic measures have been necessary this summer to control the Japanese Beetle, which has infested the Bronx and lower Westchester more seriously than ever before. Almost every type of flowering plant has been attacked. At the Garden, traps supplied by the United States Government proved to be the most effective combatant. In the period between July 16th and August 21st ap-

proximately 175,000 beetles were eradicated by the traps; 32,000 were destroyed by intermittent hand-picking. The beetles lay eggs repeatedly during the season, hence a ground poison is also essential. Badly infested areas at the Garden were treated to a cover of arsenate of lead, one pound to one hundred square feet; and in addition plants were sprayed with a strong solution of this chemical.

ERRATUM

The plant shown in the illustration on p. 195 of the August JOURNAL is *Blephilia ciliata,* not *Pentstemon,* as there indicated.

AUTUMN LECTURES

Delivered in the lecture hall of the Museum Building, illustrated by lantern slides; free to the public. 3:30 P. M. Saturdays; late-comers admitted at 3:45

Sept. 7. "Wild Flowers of the Season," Dr. J. H. Barnhart, Bibliographer.
Sept. 14. "Germination of Seeds," Dr. Wm. Crocker, Boyce Thompson Institute for Plant Research.
Sept. 21. "Local Ferns," Mr. George T. Hastings, Theodore Roosevelt High School.
Sept. 28. "Dahlias," Dr. Marshall A. Howe, Director-elect.
Oct. 5. "Fall Work in the Garden," Mr. T. H. Everett, Horticulturist.
Oct. 12. "Autumn Coloration," Dr. A. B. Stout, Director of the Laboratories.
Oct. 19. "Mushrooms, Edible, Poisonous, and Otherwise Interesting," Dr. Fred J. Seaver, Curator.
Oct. 26. "Fungi and Our Food Supply," Dr. B. O. Dodge, Plant Pathologist.
Nov. 2. "Why Orchids Fascinate," Mr. Carl T. Ramsey.
Nov. 9. "Color in the Winter Garden," Mr. Henry Teuscher, Dendrologist.
Nov. 16. "Interesting Plants of the Southeast," Mr. E. J. Alexander, Curator of the Local Herbarium.
Nov. 23. "Clematis for American Gardens," Dr. J. E. Spingarn.
Nov. 30. "Water Features in the Garden," Mr. A. C. Pfander, Assistant Superintendent.

COURSES OF STUDY OFFERED IN 1935–36

Under the supervision of Dr. Forman T. McLean

FIELD IDENTIFICATION STUDIES

1. *Tree and Shrub Studies.* 6 sessions, Saturday mornings from 9:30 to 12:30, Sept. 28 to Nov. 2. Fee $6.00. Half price to New York City teachers.
2. *Knowing Trees by Their Buds, Bark, and Shape in Winter.* 10 sessions, Saturday mornings from 10:30 to 12:30, Nov. 16, 23, 30; Dec. 7, 14, 21, 1935, and Jan. 4, 11, 18, 25, 1936. Fee $6.00. Half price to New York City teachers.
3. *Leaves and Flowers of Trees and Shrubs in Spring.* 6 sessions, Saturday mornings, 9:30 to 12:30, April 18 to May 23, 1936. Fee $6.00. Half price to New York City teachers.
4. *Our Native Ferns and Their Allies.* 6 sessions, Tuesdays at 4:00 P. M., April 21 to May 26, 1936. Fee $5.00.

FALL AND WINTER GARDENING

Practical instruction and training in the handling of outdoor plants in the fall and management of house plants in winter. Wednesday mornings, 9:30 to 12:30, at the Propagating House. Greenhouse facilities are available during the term. 10 sessions, Sept. 25 to Nov. 27, 1935. Fee $20.00.

SPRING GARDENING

Practical gardening in the greenhouse and out of doors. Plants are started in the greenhouse, grown by members, and taken to their own gardens in May. 10 sessions of three hours each. Fee $25.00.

a. *Introductory*—Wednesday mornings, 9:30 to 12:30, March 25 to May 27.

b. *Advanced*—Wednesday afternoons, 1:30 to 4:30, March 4 to May 13, excluding International Flower Show Week in March.

SCIENCE COURSE FOR PROFESSIONAL GARDENERS

This course deals with the sciences underlying horticulture and thus provides instruction in the application of science to horticultural practice rather than a training in gardening. It is necessarily limited to properly qualified students and is designed primarily for professionals, nurserymen, and florists. Inaugurated three years ago, and having the support of the National Association of Gardeners and of the Horticultural Society of New York, it has brought together a capacity enrollment of experienced and interested students. The fact that The New York Botanical Garden provides specialists from its staff for most of the lectures has made it possible to keep the cost to students low enough for assistant gardeners as well as superintendents to avail themselves of the opportunity. The fee for each series of 12 lectures is $5.00. Applicants are urged to register early.

Lectures are of one hour's duration, and are so arranged that men taking the lectures of either the first or second year course will find it necessary to attend only one night a week. Upon completion of the full course a certificate is granted by the Botanical Garden. Classes meet on Monday evenings at 8:00, in the rooms of The Horticultural Society of New York, at 598 Madison Avenue, near 58th St.

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12 lectures, Systematic Botany I
12 lectures, Plant Morphology
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12 lectures, Plant Breeding
12 lectures, Plant Pathology
12 lectures, Soils and Fertilizers
12 lectures, Entomology

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THE DUTCH ELM-DISEASE, THE JAPANESE BEETLE, AND THE GYPSY MOTH AT THE BOTANICAL GARDEN
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THE CUSTARD-APPLE FAMILY IN FLORIDA

No one traveling in the Andean forests can fail to be impressed by the variety and importance of the native fruits of the Custard-apple Family (*Annonaceae*). Passing toward and into the North Temperate Zone, the genera and species gradually disappear, until the last of them, the northern paw-paw (*Asimina triloba*), finds its northern limit along the eastern Canadian border. There seems reason to believe that two good species are included under this name, and as we reach the rich and warm forests of the southeastern United States, another makes its appearance, both extending into Florida, where a number of species of related genera occur.

The second species of true *Asimina, A. parviflora* (Michx.) Dunal, has a much more restricted geographic area than *A. triloba*. It ranges from northern penisular Florida to Mississippi and North Carolina, mainly in the Coastal Plain, but reaching the foothills of the highlands. It presents an anomaly in that the plant—leaves, flowers, and fruits—is an almost exact miniature of the common paw-paw, yet every part so distinctive that the two need never be confused.

All these Annonaceous fruits are decidedly "edible," although their edible properties are somewhat restricted by their peculiar flavor, which, while highly esteemed by many, is objectionable, or at least not attractive, to many others. It is not strange that the members of such a tropical group growing in Florida should be of exceptional interest to northern visitors. This would be the more true, but for the fact that their fruits mostly ripen during the hot summer months, when the Florida climate is shunned by most,

notwithstanding the fact that many sections are little less agreeable in summer than in winter.

It seems strange that the possibilities of developing horticultural products by the breeding of these trees and shrubs should not have made greater appeal to fruit-growers. The well-ripened fruits of the common paw-paw are really delicious, and the sugar-apple, naturalized from tropical America, is of the same type as, and a fair substitute for, the famed cherimoya of Peru. Although the Florida paw-paws are generally regarded as rather too highly flavored, at least two of them compare favorably with our northern species, and might easily be so improved by cultivation as to yield acceptable commercial fruits.

Greatly interested in these plants, seen in the flowering stage during the past winter, I was formulating plans for securing their fruits during the present summer, when I was surprised to learn that at The New York Botanical Garden there was an almost complete collection of all the Florida species, represented by separate specimens of flowers, fruits, and seeds, as well as by herbarium specimens, collected by Dr. John K. Small during his years of study of the Florida flora. It is from this collection that the following notes are drawn and I am indebted to Dr. Small for most of my information concerning the fruits in their fresh condition.

Two of the species, both tropical and growing in southern Florida merely as northward invaders, are small trees. They belong to that section of the family having numerous carpels coalescing to form large fleshy strawberry-shaped fruits, like the Andean and cultivated cherimoya. Their numerous one-seeded carpels are arranged about and along a central carpophore or core to form a short-conical fruit, the large seeds imbedded in an abundant soft pulp, something like that of the banana, or of a very ripe melon. The outer surface of each carpel forms a large scale-like marking, somewhat resembling those on the surface of the pineapple.

In the sweet-sop or sugar apple (*Annona squamosa* L.), of greenish yellow color when ripe, each of these scales bears a short central beak, whence the name "*squamosa*." This fruit reaches a length of three or four inches and its pulp, as the English name indicates, is very sweet.

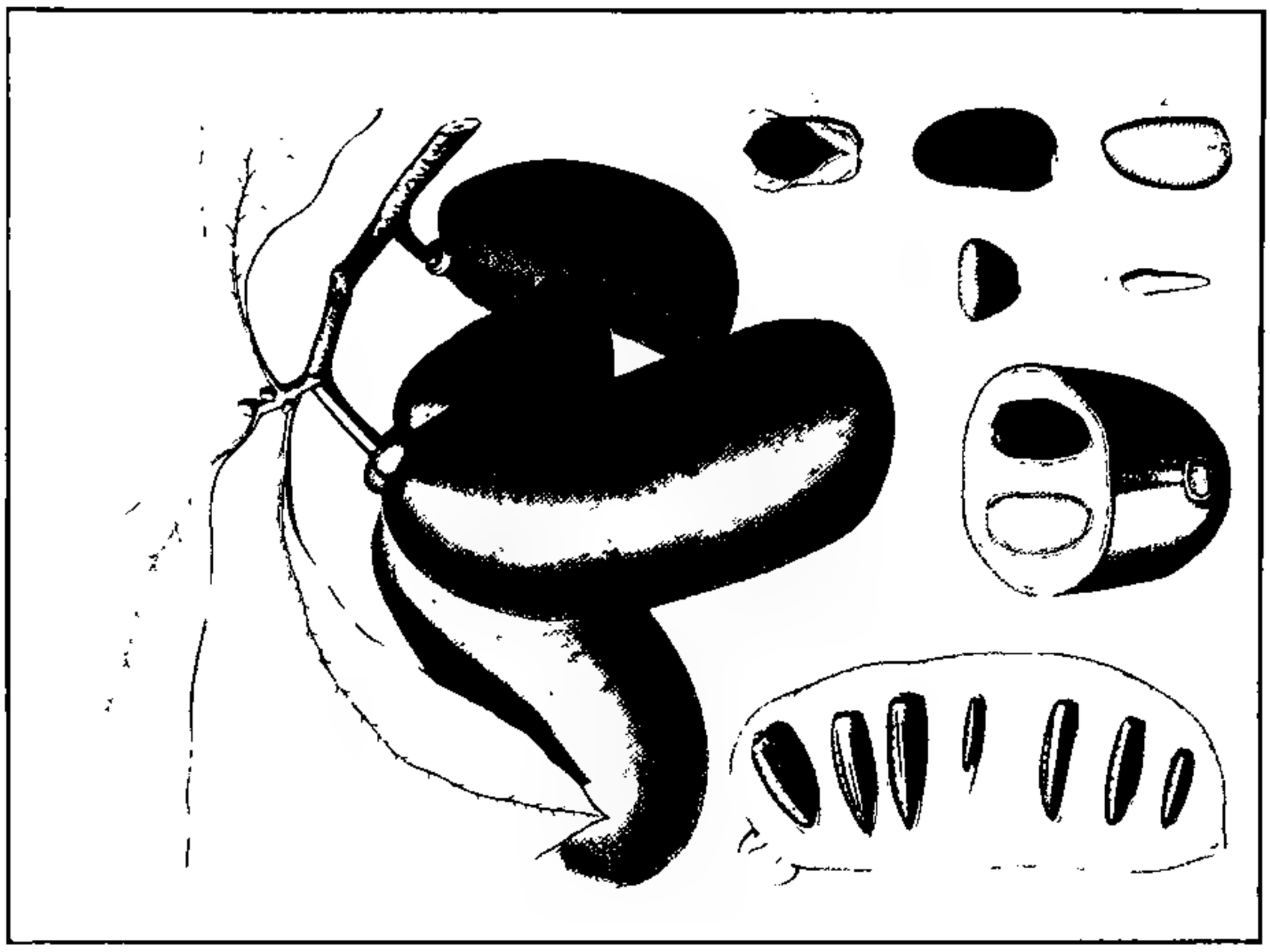
The other species, *A. glabra* L., the pond apple or alligator apple, grows in swamp lands and is a good-sized tree. Its fruits are about

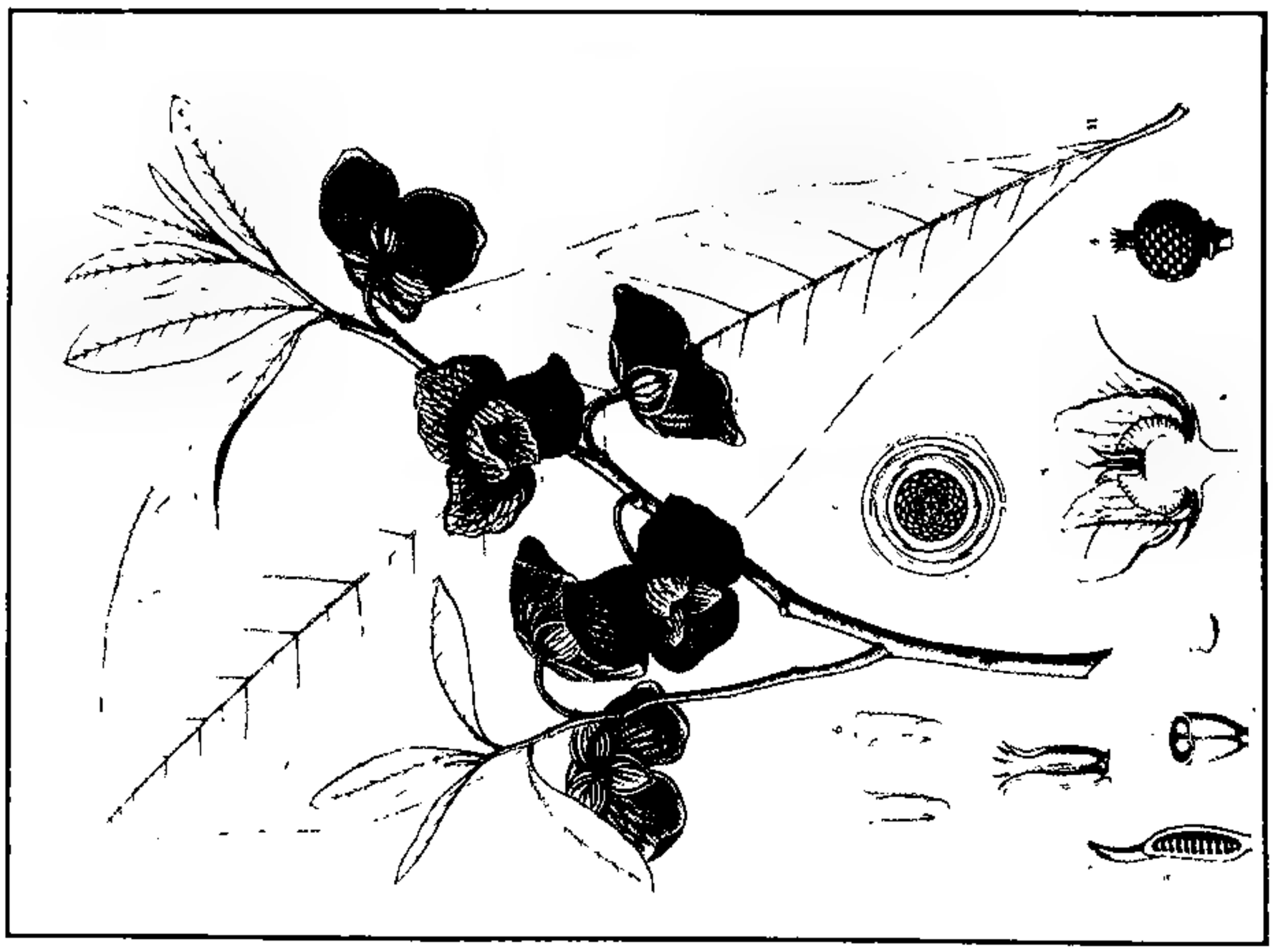
FIGURE 1. The sour-sop, *Annona muricata*.

a half larger than the sweet-sop, mostly somewhat lop-sided and yellowish brown when ripe. The scales of the surface are not beaked as in the preceding.

A third species, *A. muricata*, the sour-sop, is cultivated in Florida, but there seems no reason why it should not escape and become naturalized. It produces a very important fruit in the tropics, growing upon a small tree. Its general appearance is similar to that of *A. squamosa*, each of the scales being shortly and stoutly beaked. It often attains a large size, some that I have seen having a weight of 5 or 6 pounds. Its rich and juicy pulp has an agreeable sharply acid flavor, so that most persons prefer to sweeten it slightly before eating. Drowned in port wine, with or without sweetening, it provides a most delicious dessert.

All the other members of this family growing in Florida are natives. All belong to that division of the family having the carpels distinct, each forming in fruit a sort of elongated berry containing one or two rows of seeds, and which, if dry and dehiscent, would be a legume or follicle. They comprise three genera, the





general character of all the fruits being typified in their largest member, the common paw-paw of the North. These fruits, although growing throughout most of our southern and central states, are comparatively little known commercially. Externally, their similarity to the banana is quite marked, and their pulp is also very similar, so that the fruit has come to be known as the Michigan banana. They are shorter and stouter than the banana, and are blunt at the end. They contain one or two rows of large almond-like seeds embedded in the pulp. Two or three such fruits are commonly produced by a flower. Closely related to the asiminas, some think too closely, is the genus *Pityothamnus* Small, which differs in the venation of the petals and other characters of the flowers, and in having coriaceous leaves. *P. obovatus* (Willd.) Small (flag paw-paw), is widely distributed over the lake region of peninsular Florida. It is a branching shrub, often tree-like, and attaining a height of ten feet, growing in pine-lands and scrub. The veins of the lower leaf-surfaces are somewhat reddish-hairy. The fruit consists of three frequently more or less distinct carpels. Small describes them as mostly 6–12 cm. (2½ to 5 inches) long. The largest in our Museum are three inches long and a little more than a third as thick, lightly curved, lightly laterally compressed and slightly turgid with the seeds. The fruit usually bears a short thick abrupt beak. The pulp is quite abundant. The seeds are much like those of the common paw-paw, but proportionately smaller, dark-brown and strongly shining. The open foramen is oblong.

Pityothamnus incanus (Bartram) Small, the large-flowered paw-paw, is also known as flag paw-paw. It ranges from southern Georgia into the northeastern counties of Florida. This is a shrub reaching a height of four or five feet, sparingly branched, and its young shoots clothed with pale tawny hairs. Its fruits are only 1½ to 2 inches long and a little more than half as broad. They are very slightly compressed laterally and are not beaked. The dorsal suture is sometimes slightly elevated and sometimes depressed. When fully ripe its seeds produce little if any turgescence. These fruits are not very pulpy. The seeds are of a rich brown color, very smooth, and brightly shiny. They are about half an inch long and their general shape is much like that of the berry itself.

Pityothamnus reticulatus (Chapman) Small, the dwarf paw-paw, is the species most likely to be noted by visitors, since it occurs

mostly throughout peninsular Florida and is liable to be found in flower at almost any time during the year, though its regular season may be given as from January to April. On the roads about Sarasota and Arcadia it is noted in abundance as one drives along. The shoots usually occur in clusters of three to five, grow erectly and with little branching to a height of a yard or less. The young shoots are tawny, hairy, and bear many pendulous or drooping flowers throughout a large part of their length. The flowers are white or whitish, of thick and fleshy consistence, with their parts in threes. They are from an inch to an inch and a half long and do not expand widely. The fruit sometimes reaches the length of nearly three inches. Our museum specimens are very small, only 1¼ by ¾ inches, very slightly curved, blunt at the end and almost circular in transverse section. The sutures are not prominent and the color is dark brown. The seeds are light brown and strongly shining, ½ inch long by ⅜ inch broad and but little compressed. The open foramen is broadly elliptical.

Pityothamnus pygmaeus (Bartram) Small, the prostrate paw-paw, also of northern Florida, extends southward along the east coast. It is not only a dwarf, with stems but a foot or two long, but these are inclined to be prostrate or decumbent. They are mostly clustered, of a reddish color and softly hairy when young. The fruit is much like that of the preceding species, very blunt, little curved, and turgid at the location of the seeds. In the percentage of its pulp, this species excels all others, and this pulp is exceptionally sweet. The seeds are very small, only ½ to ¾ inch long, obovoid, moderately compressed and with nearly circular open foramen.

Pityothamnus angustifolius (A. Gray) Small, the long-leaved paw-paw, is a bushy species, extending from northern Florida into southeastern Alabama and southern Georgia. It reaches a height of some five feet, with reddish stems, which are slightly downy when young. The fruit attains a length of 3 inches and is more slender than in the other species, its thickness less than a third of its length and nearly circular in transverse section. It is strongly curved, sometimes obscurely beaked and the base contracted or substipitate, the dorsal suture commonly lightly channeled. When fully ripe, the seeds, dark brown and strongly shiny, are about one half inch long and two thirds as broad, strongly compressed, obovoid, the open foramen from narrowly to broadly elliptical.

Of *Pityothamnus tetramerus* Small there are no specimens of fruit in the exhibition collection at the Garden. Small reports it as a shrub one to three meters tall, irregularly branching and the twigs red-pubescent. The fruit is more or less ellipsoid and two to three inches long. It has been found only near the estuary of the St. Lucie River.

The remaining genus, *Deeringothamnus,* was discovered by Small on the watershed of Peace River, near Punta Gorda, in the spring of 1924. The plant made its presence known to those passing by its very powerful and delightful fragrance. This species, *D. pulchellus* Small, the squirrel-banana, is a slender shrub which sends up a cluster of several, sometimes many, erect slender and wiry stems a foot or less high from a thick tap-root of about the same length, which has a strong licorice-like odor. The floriferous stems are leafless except for some leafy bracts, while the sterile stems are abundantly leafy. The flowers appear in April and the fruits mature in August. The latter are in general much like those of the preceding genus but smaller. They occur mostly two from a flower and reach a length of two inches, the thickness being from a third to a half as great. The base is contracted into a short stout stipe and it frequently terminates in a slight beak. There is a gradual slight increase in thickness from base to tip and they tend to be irregularly constricted between the seeds, which number from two to four. They are in general circular in outline. The yellowish surface is usually glaucous. The amount of pulp is about the same as in the preceding genus. Small reports the fruit as being sweet and well flavored but rather strongly spicy. It is so greedily sought by squirrels and other small animals that specimens are difficult to obtain.

Deeringothamnus Rugelii (Robinson) Small, the yellow squirrel-banana, which occurs in northeastern Florida, is very similar to the last but has yellow flowers. The fruit is about a half longer, is more slender and more strongly curved. The surface is rendered very uneven by the more numerous, larger and more bulging seeds. Specimens in our Museum are about three inches long, 7/8 inch thick and contain six to eight seeds. The latter are yellow or pale brown, shiny, 1/2 inch long and 3/4 as broad and regularly ellipsoidal.

H. H. Rusby.

FIGURE 1 Photograph [illegible]nt of the bird's-foot violet in flower, taken August first. (See text.)

AN EVER–FLOWERING VIOLET

The bird's-foot violet (*Viola pedata*) delights in poor soil. With this advantage a wide geographic range might be expected. An examination of herbarium specimens shows that the plant occurs in the eastern United States, the states bordering the Mississippi River, and those contiguous on the west; it is also recorded as occurring in Manitoba. In the northeast, Vermont, New Hampshire, and Maine are lacking in its geographic range.

Within this range the many kinds of soil contribute to the growth of more or less different forms. The two outstanding variations are shown in the plant with uniformly lilac-purple petals and that with the two upper petals a dark violet. The latter plant is the one upon which Linnaeus based the name and the original description of the species. The form with uniformly colored petals is known as *Viola pedata lineariloba,* a name, however, of little significance. Naturally the leaves and flowers throughout such a wide geographic range show many gradations of leaf-form and color-shades in the flowers.

The popularity of this violet has caused it to receive a number of names, specific (four names) and varietal (five names), based on the variations in the leaves and the flowers, and a generic name. Both color-forms occur in nearly all the states within its range. In some states, however, one form or the other seems to dominate.

The bird's-foot violet is, typically, a spring flower. The early warmth in spring brings the energy stored up in the thick caudex-like base into action and the plants are soon in flower, individually or in large carpet-like patches.

However, an examination of the specimens in a large herbarium will show that plants may be found in flower in the summer and fall months. Of course, the same condition is frequently observed by the field botanist. An instance of plants grown in a garden in the red sandstone hills of York County, Pennsylvania, was brought to mind by the photograph shown in FIGURE 1. These plants, brought from the nearby rocky woods, flowered continuously from early spring to autumn each year for a period of more than a decade. Three of these plants were set out in the old rock garden opposite Fordham Hospital some fifteen years ago and may still

FIGURE 2. A herbarium specimen of the bird's-foot violet, about 1/3 natural size, collected in the very poor soil on Stone Mountain, Georgia, showing about the maximum height—twelve inches—this plant attains in its native haunts.

survive. Specimens brought to the Garden from Massachusetts by Mr. Alexander, in 1933, and set out in the new rock garden, flower throughout our growing season.

It seems strange that a plant as showy and as easy to grow should not be found in American gardens, not only in its native state, but further developed as a horticultural subject. Among the many natural forms are extremes of growth; plants with small prostrate leaves and flowers, as shown in FIGURE 1, up to those with large erect leaves and flower-stalks a foot high, as shown in FIGURE 2, withal a striking plant. The maximum flowers are over an inch and a half wide. All the forms are worthy of cultivation.

JOHN K. SMALL.

RESOLUTIONS OF THE BOARD OF MANAGERS IN ACCEPTING THE RESIGNATION OF DIRECTOR MERRILL

WHEREAS, Dr. Elmer Drew Merrill, Director of The New York Botanical Garden since January 1, 1930, has tendered to the Board of Managers of the Garden his resignation of this post, effective on October 1, 1935, in order to accept appointment as Professor of Botany and Administrator of Botanical Collections at Harvard University, therefore,

BE IT RESOLVED, By the Managers of The New York Botanical Garden, that they are highly appreciative of the very efficient services that Doctor Merrill has rendered to the Garden during his tenure of office of somewhat more than five and a half years; that they have noted, in particular, the promptness and foresight with which he has secured for the Garden assignment of workers and appropriations of funds by various emergency relief and employment bureaus for general assistance and for much needed repairs and improvements; that they have observed with gratification the development of horticultural features which have made the Garden increasingly attractive to the general public; that they have noted, with wonder and admiration, Dr. Merrill's ability, in spite of exacting executive duties, to continue his systematic studies of Oriental plants, studies which have made him the outstanding leader in this field; that they have observed with satisfaction the honors that have been bestowed upon him by American, foreign, and international scientific organizations. While the Managers greatly regret his going, they extend to Doctor Merrill their very best wishes for happiness in his new field and for a most successful continuation of his distinguished career.

FIGURE 1. The Mexican tulip poppy, *Hunnemannia fumariaefolia*, with standard heliotrope and ageratum.

HUNNEMANNIA FUMARIAEFOLIA

During the last two years the Mexican tulip poppy (*Hunnemannia fumariaefolia*) has been used with good effect and has succeeded well in the flower borders at the Botanical Garden. It is one of a rather limited number of plants which when raised from seed sown early in the year can be relied upon to produce a display of bloom continuously from the time the first flowers appear until the advent of killing frost. The plants grow to a height of about two feet and make a mass of feathery, glaucous, blue-green foliage against which the canary-yellow, cup-shaped flowers, each with a central bunch of orange stamens, appear to advantage. When used in association with blue, lavender, or purple-flowered plants, *Hunnemannia fumariaefolia* is particularly pleasing, and effective color schemes can be worked out by using this species in conjunction with such subjects as heliotrope, ageratum, and *Verbena venosa*.

The cultivation of the Mexican tulip poppy presents no special difficulties although it must be confessed that it is more exacting in its requirements than are many of the plants commonly grown as garden annuals. In the first place it demands a sunny position and a well-drained soil. Then (like many members of the Poppy Family) it resents root disturbance and cannot be readily transplanted. To overcome this difficulty it has been the practice at the Garden to sow the seeds directly in 2½ inch pots (several seeds in each receptacle) in the greenhouse in February; later the young plants are moved into pots of four-inch size without breaking the ball of soil and the seedlings are thinned out as may be necessary. By following this plan sizable specimens for planting out in the garden are secured by the end of May and they commence to bloom about the middle of July.

Where greenhouse facilities are not available, satisfactory results are obtained by sowing the seed in the open border about the third week in April, choosing a day for sowing when the soil is in a nice friable condition. The seed is slow in germinating and three or four weeks will elapse before the seedlings break ground. Sturdy growth is encouraged by frequent use of the cultivator to maintain the surface in a loose condition and when the young plants commence to crowd each other they are thinned out so that they stand about eight inches apart.

Hunnemannia fumariaefolia is a sturdy subject and does not require artificial support. It endures drought well and so far as I have observed is not subject to disease or insect pests. One detail of routine which must receive attention throughout the blooming season is the removal of the seed pods and these should be taken off just as soon as the petals fall. As a cut flower the Mexican poppy is superior to most of its relatives for the flowers remain in good condition for two or three days in water.

T. H. EVERETT.

A SIX WEEKS' COURSE IN PRACTICAL HORTICULTURE

The course in practical horticulture and garden problems which was inaugurated last winter at White Plains will be repeated this fall at the American Museum of Natural History, 77th Street and Central Park West, Manhattan. The lectures will be presented by Mr. T. H. Everett, and will be illustrated by specially prepared lantern slides.

The class will meet every Wednesday at 8:30 p. m. for six weeks, beginning October 16th, for an hour's lecture followed by an informal discussion forum. Last year the course was open to non-members upon payment of a fee, but the large enrollment has made it necessary to limit the registration this year to members only. No charge will be made, and member Garden Clubs may each delegate three representatives to attend. An early notification by card to The New York Botanical Garden from those members who desire to take the course will greatly facilitate making accommodations.

The topics covered will be: Soil Preparation, considering especially the chemical, biological, and physical aspects of the soil, and including compost for house plants; Seed Sowing, indoors, in frames, and out of doors, and subsequent care; Vegetative Propagation, by various leaf, stem, and root cuttings, air layering and root divisions; Planting, Watering, and Feeding; Pruning and Training; and the detailed planning and follow-through of a typical mixed border of about seventy-five specified annuals and perennials.

One of the functions of the course will be to enable members of the Garden to benefit from the general discussion of their garden problems. Members of the Garden are entitled to attend other courses offered to the full value of their membership fee. This course in Gardening practice, however, is given as an additional service without deduction from membership credit.

THE SITUATION REGARDING DUTCH ELM-DISEASE, THE JAPANESE BEETLE, AND THE GYPSY MOTH AT THE BOTANICAL GARDEN

The Dutch Elm-disease

We have about nine hundred elm trees in The New York Botanical Garden and there are about the same number in the Zoölogical Park nearby. Members and friends of these institutions are naturally interested in knowing what progress is being made in the control of the Dutch elm-disease, which was first found in this vicinity in 1933. Because one sees little about the disease in the press nowadays, and as the elms we see about us do not appear to be suffering from any severe epidemic, one might think that it was all more or less of a scare over little or nothing. If one visits the offices of the Federal and New York State headquarters in the County Building in White Plains, he will find, however, that this is not the case. There is a real fight going on against the disease. Dr. W. H. Rankin, in charge of the state forces, is concerned primarily with control measures and he directs the destruction of diseased trees and other sanitary measures. Mr. John Wooton, representing the U. S. Department of Agriculture in this state, is in general charge of the force of scouts who inspect every elm in the region covered by the survey once each month during three or four months in the summer. One can see in their offices large maps of each of the regions being surveyed. The area scouted covers about one hundred and fifty square miles, divided into seventy-four survey areas. Every diseased elm is represented by a pin stuck in the map so that one can readily see from the map the extent of the infection in any locality.

When a scout sees a branch showing a wilted condition he climbs the tree, no matter how high it is, crawls out on the large limbs and

cuts off the branch. We do not realize the dangers these scouts encounter in this work, as they swing from limb to limb and tree to tree by means of ropes, with the agility of monkeys. Pieces of twigs are sent to a central culture laboratory in New Jersey, where a study is made and a report rendered within a week's time. If the report is positive the tree which has been given a numbered tag is promptly removed. Not more than three weeks elapse from the time of positive determination of the disease and the burning of the tree. Coöperation of the public has been complete, so that it has not been necessary to resort to legal action in a single case in this work involving the destruction of more than four thousand diseased elm trees and many more thousands of elms that were either dead or dying from other causes and would thus serve as breeding places for the elm bark beetle, which is the main carrier of the disease.

Dr. Rankin informs me that at the close of the year 1934, the disease was found to be prevalent in the area within thirty miles from Manhattan and that here and there for an additional ten miles a few more cases of infection could be found. Without carrying out any control measures it would be expected that one would flnd about three times as many infected trees in a given area in 1935 over the number found in 1934. The results of their surveys show that where comparable surveys were made such expected rate of increase was reduced to one-third, indicating that on the whole the control measures seem to be giving good results.

During 1934 four elm trees infected with the disease were found in The New York Botanical Garden grounds. They were destroyed. No additional infected elms were found in 1935, although two trees dying from the disease were found on City property along the Bronx River near our rose garden. Three or four large elms infected with the *Verticillium* wilt disease were destroyed because they were badly infested with the bark beetle. Twenty-three diseased elms were found in Manhattan in 1934 and only one additional tree in 1935. In the Bronx the results are not so encouraging, 322 for 1934 and 304 for 1935. For Richmond there were 529 found in 1934 and 256 in 1935. In Westchester the figures are 721 for 1934 and 824 for 1935, and in Rockland there was an increase from 117 to 470. These increases were probably due to the very much more thorough inspection in 1935.

It will take two or three more years before it can be known definitely whether the forces now at work will eventually succeed in controlling the disease. The remembrance of the loss of all of our American chestnuts is still vivid enough to remind us that this is no time to be parsimonious, either in personnel or in financial assistance, if our elms are to be saved.

The Japanese Beetle

Many of us recall how, seven or eight years ago, Mrs. Britton began bringing over to the Museum Building pint cans filled with Japanese beetles which she had picked from roses and grapes in her own and in her neighbors' gardens. To make sure that none escaped she first jarred the beetles into a can of kerosene. This method has also long been about the most satisfactory way of getting rid of the common rose bug. We never understood what special dispensation was preventing the beetles from crossing the railroad tracks and invading the Botanical Garden two blocks away. For several years only a few stray beetles were found in our grounds at the time they were so numerous and destructive a few blocks away.

The brown Asiatic garden beetle, however, had become rather troublesome by 1932. In several places the lawns were being destroyed by their larvae, and it had been necessary to spray some plants such as asters, dahlias, and chrysanthemums that were being attacked by the adult beetles. Sample diggings in 1932 showed as many as a hundred grubs to a square foot of lawn surface. Larvae of the Asiatic and May beetle were present in about equal numbers. Larvae of the Japanese beetle were present but in much fewer numbers. About two acres of lawn were treated with arsenate of lead, using from ten to fifteen pounds to each thousand square feet. A strip was left untreated as a control.

In early July, 1934, the Japanese beetles began invading the Botanical Garden in considerable numbers. They attacked the blossoms of white peonies and blooms of standard roses in the borders. Although they were not present in the rose garden in any great numbers it was deemed advisable to arsenate the sod strips between the beds and along the paths and roadsides. As an experiment in coöperation with Dr. C. H. Hadley, of the U. S. Department of Agriculture, we set up twenty beetle traps baited with

geraniol. The rose garden is isolated in such a way that there was little danger of drawing in more beetles from the outside than we caught in the traps.

Several thousand square feet of lawn back of the Museum Building, where much of the rough lawn had been destroyed by the larvae, were also treated with the arsenate in 1934. The beneficial effects of this treatment could be seen this summer. During the hot days of July, as one walked across the untreated areas, he could see thousands of Japanese beetles flying about or balled together in groups of fifty or more, while very few could be found where the arsenate had been applied four years previously.

It is evident from the many telephone calls and letters of complaint received at the Garden that there has been a great increase in the numbers of Japanese beetles in the vicinity of New York City this year. For the first time they have become a serious problem with us. We caught many more beetles in the twenty traps at the rose garden in 1934 than we did in the same traps in 1935. This may have been due in part to the treatment of the sod in 1934 against the larvae. This year, each afternoon from July 15 to September 7 the beetles were hand-picked from rose blooms. If there were any present one usually found four or five, and sometimes as many as twenty in one bloom. In all, about 45,000 beetles were gathered by hand. They seem to prefer blooms of Red Radiance, La Tosca, Radiance, and Miss Rowena Thom. Very few ever visited the Polyanthas. Fortunately the period when the beetles were the most numerous corresponded with the summer period, July 15 to September 1, when there were the fewest rose blooms. There is no question that one can have hybrid tea blooms in the summer if the beetles present are shaken into a can of kerosene.

The leaves of bush roses around the borders were also attacked. Japanese beetles attack only certain kinds of ornamentals, so that by spraying those attacked, such as zinnias, asters, and Hibiscus, one can still have many flowers. This year we set up twenty additional traps, at various places on the grounds, and caught about 175,000 beetles in the forty traps set. The season when they were really serious lasted from about July 10 to September 1. Our sassafras trees, certain cherries, and lindens were about the only trees that were to their liking. The common Polygonum also served very well for their food. All such trees and any shrubs and

annuals attacked were sprayed two or three times with arsenate of lead, using about six pounds of the powder to one hundred gallons of water, to which was also added one pint of fish oil to make the arsenate spread out more evenly and stick to the foliage longer. Linseed oil may be used if the cheaper fish oil is not at hand.

By treating the lawn with lead arsenate as noted above, by spraying infested plants with the same poison, by trapping, and by hand-picking from roses and other valuable flowers, we were able to come through the summer without any serious losses.

We have had many inquiries regarding the use of traps. Federal forces who have done much work on the problem do not advise individuals in cities to use traps unless there is a heavy infestation and the neighbors coöperate by also using traps. Many beetles are drawn in the general direction of the traps by the geraniol bait. Many are not caught and they therefore settle down to feed on nearby flowers. Later they lay their eggs in the sod. In this way one is in danger of increasing rather than decreasing the number of beetles in his garden.

Federal forces are still trying to find parasites that will attack the larvae readily enough to hold the beetles in check naturally, as is the case in Japan. Until more efficient parasites are found it will be necessary to continue using the makeshift methods of control described above.

The Gypsy Moth

The Japanese beetle may give us serious trouble for some years to come. It is good to know that there are many ornamental plants that are not attacked at all by this insect. The Dutch elm-disease may eventually do to our elms what it has already done to the elms of Holland and some other European countries. This disease is confined to elms. The Gypsy moth in some respects is even more to be feared. The "barrier-zone," originally set up on the western border of Connecticut, was passed last year so that a number of centers of infestation were found in the Bronx in July. At the request of the writer, Mr. H. L. McIntyre, of the State Conservation Department, prepared a short paper for the Journal[1] on the Department's Gypsy Moth work. The reader will find in this

[1] McIntyre, H. L. Gypsy Moth Control in New York State. Jour. N. Y. Bot. Gard. **36**: 69–73, *f. 1.* 1935. (Copies of this article are available.)

paper an illustrated account of the life history of the insect, a report on the extent of the invasion, and the measures being carried out by the Federal and State authorities to prevent further invasion.

The writer has been interested in following the work directed by Mr. McIntyre and carried out by his representative, Mr. J. M. Muiry, in New York City and vicinity. During the fall and winter a very extensive survey was made in which every shrub and tree in our Botanical Garden grounds was examined for the egg masses. Where found they were painted with creosote. Several centers of infestation were found on our own grounds and in the vicinity. Each scout employed had his own particular way of marking inspected trees so that any oversight discovered later could be traced to the individual inspector. Large numbers of clean trees were banded with tanglefoot material, or with burlap bands, the latter to serve as a snare under which the insects would lay their eggs, so that the eggs could be found and destroyed. In May this year about the time the eggs would normally hatch, spraying operations by the State forces were begun. Powerful sprayers giving a force of eight hundred pounds to the square inch and capable of spraying six hundred gallons every fifteen minutes were used. Over a thousand feet of pressure hose were necessary to reach some of the trees. So well was the arsenate applied that today, four months later, many leaves show the poison.

Members of our institution may rest assured that a more thorough job of protecting our trees against the Gypsy Moth could not be desired.

B. O. Dodge.

PROCEEDINGS OF THE INTERNATIONAL BOTANICAL CONGRESS

The Sixth Assembly of the International Botanical Congress convened at Amsterdam, September 2–7. Nearly one thousand delegates from fifty countries attended, somewhat fewer than those who attended the previous Congress at Cambridge in 1930. Sectional meetings were held under the headings of Agronomy, Genetics, Geobotany, Ecology-Phytogeography-Morphology, Mycology and Bacteriology, Phytopathology, Paleobotany, Plant Physiology, and Taxonomy and Nomenclature. Reports and proposals were submitted by each of the respective sections, and numerous papers were read at these meetings. At the final plenary session resolutions were passed urging the coöperation of governments throughout the world in establishing permanent plant reserves and for plant protection on a large scale.

Among the more significant undertakings of the Congress, at least from the viewpoint of applied science, was the appointment of a committee to prepare a standard reference list of binomials for the important economic plants of the world, in accordance with the rules and nomenclature of the International Code. When completed, this will mean an international authority for all commercial and scientific enterprises concerned with the names of plants. This list is to be valid for ten years for economic botanists, foresters, horticulturists, and non-professional botanists who must use plant names, notwithstanding changes in nomenclature that may be made by scientists within that period. This is carrying the effectiveness of the International Code a step farther and, when completed, will constitute an outstanding example of international coöperation in science.

A feature of the Congress was the numerous special excursions to historical institutions, gardens, laboratories, and national or commercial projects of related interest, including the Leyden Botanical Laboratory, the Leyden Botanical Gardens (among the oldest in existence), the National Herbarium, the University of Groningen, the University and Botanical Laboratory at Utrecht, the Institute for Sugar Beet Culture, and the Laboratory of the Government Fibre Industry. The "polders," or reclaimed areas, in the section which was formerly the Zuyder Zee, were visited by

many delegates, and offered an impressive testimony to the achievements of the scientists and engineers and agrarians of the Netherlands.

E. D. MERRILL,
President of the Section on Taxonomy.

NOTES, NEWS, AND COMMENT

At a meeting of the International Union of Biological Sciences held at Amsterdam on September 2nd, in connection with the Sixth International Botanical Congress, Dr. E. D. Merrill was elected president, succeeding Dr. A. C. Seward, of Cambridge University.

Miscellaneous gifts to the garden from numerous friends and correspondents from January 15 to September 30, not including exchanges, are as follows:

3242	living plants
939	bulbs
390	packets of seeds
86	books and manuscripts
5554	herbarium specimens

In addition several hundred reprints were received from numerous correspondents for the library and for clipping.

Dr. B. O. Dodge, President of the Mycological Society of America, and Mr. Robert Hagelstein, Honorary Curator of Myxomycetes at the Botanical Garden, attended the summer foray of the Mycological Society at Ithaca, N. Y., August 20–23. Dr. Dodge gave a talk on breeding pink bakery mould, exhibited about a hundred enlarged photo-micrographs of hybrid forms and cultures, showing the sexual reproduction of the mould. Mr. Hagelstein demonstrated his recent work on the Myxomycetes and exhibited three hundred specimens from his collection and others from the local flora. The meeting was held in the Department of Mycology of Cornell University, where every facility for exhibition purposes was provided. Through the efforts of Dr. John Dearness, Vice-

President of the Society, and of Professors H. M. Fitzpatrick and H. H. Whetzel, the foray was very successful.

Dr. A. B. Stout spent the early part of September at Rumford, Me., in a survey and evaluation of the work done in hybridizing poplars and of the experimental plantings for reforestation that are being maintained by the Oxford Paper Company. Later in the month, in the course of the work which he is carrying on at Geneva, in coöperation with the New York State Agricultural Station, Dr. Stout spoke at the annual meeting of the New York Fruit Testing Association on the subject of recent developments in seedless grapes.

Dr. William Crocker's lecture on the "Germination of Seeds," given at the Garden on September 14th, attracted a large audience, many persons lingering to ask questions afterward. Dr. Crocker discussed the effects of storage, dampness, oxygen pressure, light, temperature, and seasonal changes on the growth of many seeds. Slides of charts and photographs showing comparative development under various conditions demonstrated the significance of artificial forcing and control and revealed facts of surprising interest to the uninitiated.

Mrs. Regina Jais, a member of the Garden, received the Silver Medal in the New York Herald-Tribune Yard and Garden Contest. The Silver Medal is a special award for accomplishment. Mrs. Jais's garden is a series of terraces on the roof of an apartment building in mid-town Manhattan. Among the other results of her all-summer care were fifty ears of corn, a good crop of Delaware grapes, quantities of Dr. Van Fleet roses, and excellent long-stemmed annual asters.

The following visitors have registered in the library during the summer: Prof. M. L. Fernald, Dr. Lyman B. Smith, Messrs. Milton Hopkins, and C. A. Weatherby, Cambridge, Mass.; Dr. Alfred Rehder, Jamaica Plain, Mass.; Mr. and Mrs. D. S. Carpenter, Middletown Springs, Vt.; Prof. H. M. Fitzpatrick, Prof. H. Le Roy Andrews, Miss Sarah C. Dyal, and Messrs. Stewart H. Burnham, L. M. Black, and E. W. Lyle, Ithaca, N. Y.; Miss Marjorie E.

Swift, Princeton, N. J.; Messrs. Egbert H. Walker, E. P. Killip, and Jason R. Swallen, Washington, D. C.; Mr. J. Hershel Stone, Pittsburgh, Pa.; Mr. and Mrs. G. M. Bahrt, Orlando, Fla.; Dr. W. H. Camp, Columbus, Ohio; Prof. G. W. Martin, Iowa City, Iowa; Dr. William C. Steere, Ann Arbor, Mich.; Prof. John T. Buchholz, Urbana, Ill.; Prof. N. C. Fassett, Madison, Wis.; Sister M. Alice Lamb, Duluth, Minn.; Prof. C. Leo Hitchcock, Missoula, Mont.; Prof. H. M. Rickett, Columbia, Mo.; Prof. Samuel Geiser, Dallas, Tex.; Prof. W. L. Jepson, Berkeley, Cal.; Dr. E. B. Copeland, Chico, Cal.; Dr. Albert W. Herre, Stanford University, Cal.; Dr. Lyman Benson, Bakersfield, Cal.; Prof. P. A. Munz, Claremont, Cal.; Prof. C. D. Howe, Toronto, Can.; Dr. Rafael A. Toro, San Juan, P. R.; Señor Martin Cardenas, La Paz, Bolivia.; Dr. C. P. Sideris, Honolulu, T. H.; Mr. Adriano Buzzati-Traverso, Milano, Italy; and Mr. B. Sen, Calcutta, India.

Dr. Woon-Young Chun, Director of the Botanical Institute at Sun Yatsen University, Canton, China, was a visitor at the Garden and a guest of Dr. Merrill during the last days of September.

Dr. and Mrs. H. N. Moldenke sailed on October 3rd for a year's sojourn in Europe. They will make their headquarters at the Royal Botanic Gardens, Kew, where Dr. Moldenke will continue his studies of the *Verbenaceae*. Dr. Moldenke was awarded a National Research Council Fellowship in the Biological Sciences for foreign study. His work will take him to France, Austria, Germany, East Prussia, Holland, Belgium, and the Scandinavian countries.

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JOURNAL
OF
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B. O. DODGE

REMARKABLE VITALITY AMONG PALMS
JOHN K. SMALL

IT PAID TO TREAT THE LAWNS

A GLANCE AT CURRENT LITERATURE
CAROL H. WOODWARD

NOTES, NEWS, AND COMMENT

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JOURNAL
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A BACTERIAL DISEASE OF DELPHINIUM AJACIS

Some time in July this year the writer's attention was directed to a disease in a bed of *Delphinium Ajacis* in the border planting at The New York Botanical Garden. Individual plants here and there were considerably stunted, showing dead or dying tops. Their roots and lower leaves appeared to be perfectly healthy. These stunted plants were then only a few inches tall. Few ever recovered from the disease, which gradually worked downward nearly to the base. Such plants were pulled out and destroyed but the disease continued to spread.

FIGURE 1 shows two stunted plants with tops somewhat blackened or discolored with a soft, rather foul-smelling rot. When the stems of such plants were split down to the base it was found that most of the pith had been destroyed and mucilaginous masses of bacteria soon oozed out from the torn tissues. At the left in FIGURE 2 is shown the top of a plant which was about a foot high. All of the leaves and the stem below the part shown here were perfectly healthy, only the top being rotted; at least, the base and root-system were of normal size.

The bacteria must have been at work for considerable time, for they were present clear down to the crown, but blackening and disorganization were confined more to irregular streaks and pockets, as can be seen in the picture. Another interesting feature was, usually, the presence of white masses of long thin crystals, which under the microscope looked much like those described by McCulloch[1] in connection with her studies of *Bacterium marginatum,* the scab disease of gladioli.

[1] McCulloch, L. A bacterial blight of Gladioli. Jour. Agr. Research **27**: 225–229. 1924.

It was seen that we were likely to lose all of the plants in this bed of *Delphinium Ajacis*. As an experiment, we sprayed the plants with Bordeaux mixture and thoroughly soaked the ground with it. Whether this had any beneficial effect or not, it is a fact that there was a great improvement, and little further spread. A fairly good showing of flowers developed. Another small bed planted out later nearby was not treated. These all died out. Very likely they were either all infected when transplanted or became in-

FIGURE 1. Two plants of *Delphinium Ajacis* infected with a rather foul-smelling bacterial disease. The tips of the stems were discolored brownish or blackish and were soft and watery. The bacteria had invaded the pith region and the surrounding softer tissues. The stems have been split open to show the blackening of the infected tissues.

FIGURE 2. At the left, top of a plant, the main axis of which had been killed. At the right, a plant much stunted, its tip-end dead from the soft rot, the pith somewhat blackened in streaks or patches.

fected soon after. Bordeaux mixture has also been recommended to help control delphinium "blacks." If the bacteria causing the disease described here enter the plants through either the stomata or water pores, a covering with Bordeaux mixture would help to prevent its spreading.

Dr. F. D. Chester, of our laboratory, and Miss Lucia McCulloch, of the office of diseases of ornamentals, United States Department of Agriculture, are both studying the disease and will no doubt have further information concerning the causative organism and methods for its control. This report is presented merely to direct attention to the disease and point out some of the differences between it and the common delphinium "blacks."

The bacterial leaf-spot disease, "the blacks," of varieties of delphinium, as described by Bryan[2] and referred to by Gregory and Davis[3] and by White,[4] is familiar to growers and home gardeners. Infection is manifested by the appearance of a number of irregular black spots on the leaves. These spots may increase in size, and, by running together, disfigure the leaves considerably. Leaves may also become curled and otherwise distorted. This disease is said to infect the blossoms occasionally, and also the stems. It is not a root-rot disease, although the bacteria live over in the soil. It is a local spot-disease and not at all inclined to be systemic even when it is found on the stems.

The sclerotium or root-rot disease, which attacks the feeding roots and later the main roots and base of the stems, can also readily be distinguished.

B. O. Dodge.

[2] Bryan, M. K. Bacterial leafspot of Delphinium. Jour. Agr. Research **28**: 261–269. 1924.

[3] Gregory, C. T., and Davis, J. J. Common garden pests, what they are and how to control them. 1–150. 1928. Published by Better Homes and Gardens, Des Moines, Iowa.

[4] White, R. P. Diseases of ornamental plants. New Jersey Agr. Exp. Sta. Circ. 226: 1–98. 1931.

REMARKABLE VITALITY AMONG PALMS

(Cabbage-Tree and Royal-Palm)

Plants are wasteful in many ways. They often produce vast numbers of leaves, flowers, and fruits, apparently far in excess of what is necessary for growth, replacement, and distribution. There are, doubtless, different occult reasons for this apparent prodigality. In fact, indications pointing to possible reasons for the excess production of tissues and organs are sometimes apparently discernible.

During our explorations in Florida, examples of the apparent excess production of certain tissues in palms came to our attention. It became evident that palms through long ancestral experiences have developed different ways of dealing with adverse conditions.

The cabbage-tree (*Sabal Palmetto*), for example, is a remarkable plant in many ways. Among other things, growing as it does in all kinds of soil, on rock and in water, it exists in many forms. In fact, the forms are so numerous that they defy classification.

The cabbage-tree is amphibious. Its habitat ranges from perpetual water to permanently dry rocks. A few examples have shown the cabbage-tree as an epiphyte. It thrives also in localities that are dry part of the year and submerged the remaining part. It will flourish perfectly well where there is periodic change of the water-level amounting to six feet. This adjustment to varying depths of water is accomplished by a massive and excessive root development which extends beyond the normal growth below the surface of the ground, along the trunk to the highest water level. Thus, on the lower part of the trunk one may find a solid mass of roots, in the form of a dome or a cylinder, often six to eight feet in diameter. When the water is high these tightly packed roots are evidently active; when it is low, so that they are exposed, they are, of necessity, dormant. But, protected as they are at the tips by large root-caps, they stay alive and ready for action as soon as the water rises again. This palm is not particular as to the kind of water from which it gets moisture. Fresh or salt, hard or soft, or even sulphur water—all suit it equally well. The great excess of stem-tissue sometimes essential for the life of the palm is shown in the accompanying figures of the cabbage-palm, one of a wild specimen, the other of a cultivated one.

The plant shown in Figure 1 is growing on rock in Royal Palm

FIGURE 1. In Royal Palm Hammock, Dade County, Florida. A small cabbage-tree—*Sabal Palmetto*—growing on plate rock. Fire some years back had burned part of the base of the trunk and other parts, but particularly a section of the trunk near the crown. With all this tissue gone, the tree still thrived.

FIGURE 2. A close view of the section of the palm trunk, showing the car. The mosses and lichens in and about the scar attest that the burn vas not of recent occurrence—but perhaps a half century ago.

Hammock, Dade County, Florida. A fire many years ago burned out a section of the trunk, leaving about one third of the diameter intact. The palm continued to grow, showing no additional sign of the accident, except a slight bend in the trunk due to the lack of support and to the weight of the crown of leaves—even though this crown is small because of the tree's growing on plate rock. The palm not only survived, but stood the brunt of hurricane winds. FIGURE 2 gives a better idea of the amount of damage done by the fire. A certain amount of burning is also evident at the base of the trunk.

The cabbage-tree is often planted along roads in the country and along streets in towns and cities. FIGURE 3 shows a cabbage-tree on a street in Crystal River, Florida. The luxuriance of the crown of leaves—which is always large and heavy in palms grown in sandy or clay soil—is evident. A box had been placed around the trunk for its protection from external damage. However, when the box was removed, much internal damage was evident. Some gnawing insects[1] had been at work reducing the trunk for a long time. When the photograph was taken scarcely one third of the diameter of the trunk remained, still the crown of leaves was in perfect condition. FIGURE 4 gives an idea of how little of the trunk was left to nourish and support the crown of many leaves.

So much for the stem-system. The root-system is sometimes interesting. The royal-palm (*Roystonea regia*) is not as versatile as the cabbage-tree in the matter of habitat, but its geographic range this side of the Gulf Stream is much less extensive. However, in its restricted range—the southern tip of the Florida peninsula—it has shown itself the master of a variety of habitats, among which are plate rock, sand, marl, dry soil found high above the maximum water-table; also periodically wet and dry locations and practically aquatic situations in either fresh water or salt, or at least brackish water with the salt-saturation requisite for growth of the mangrove and oyster.

Among various examples of the excessive development of roots, FIGURES 5 and 6 show graphically a case in point. In FIGURE 6 the

[1] "The only insect that I might consider capable of causing such an amount of destruction is the palm-borer in its larval stage. This rather large beetle of the weevil family is not rare in Florida."—SIGMUND GRAENICHER.

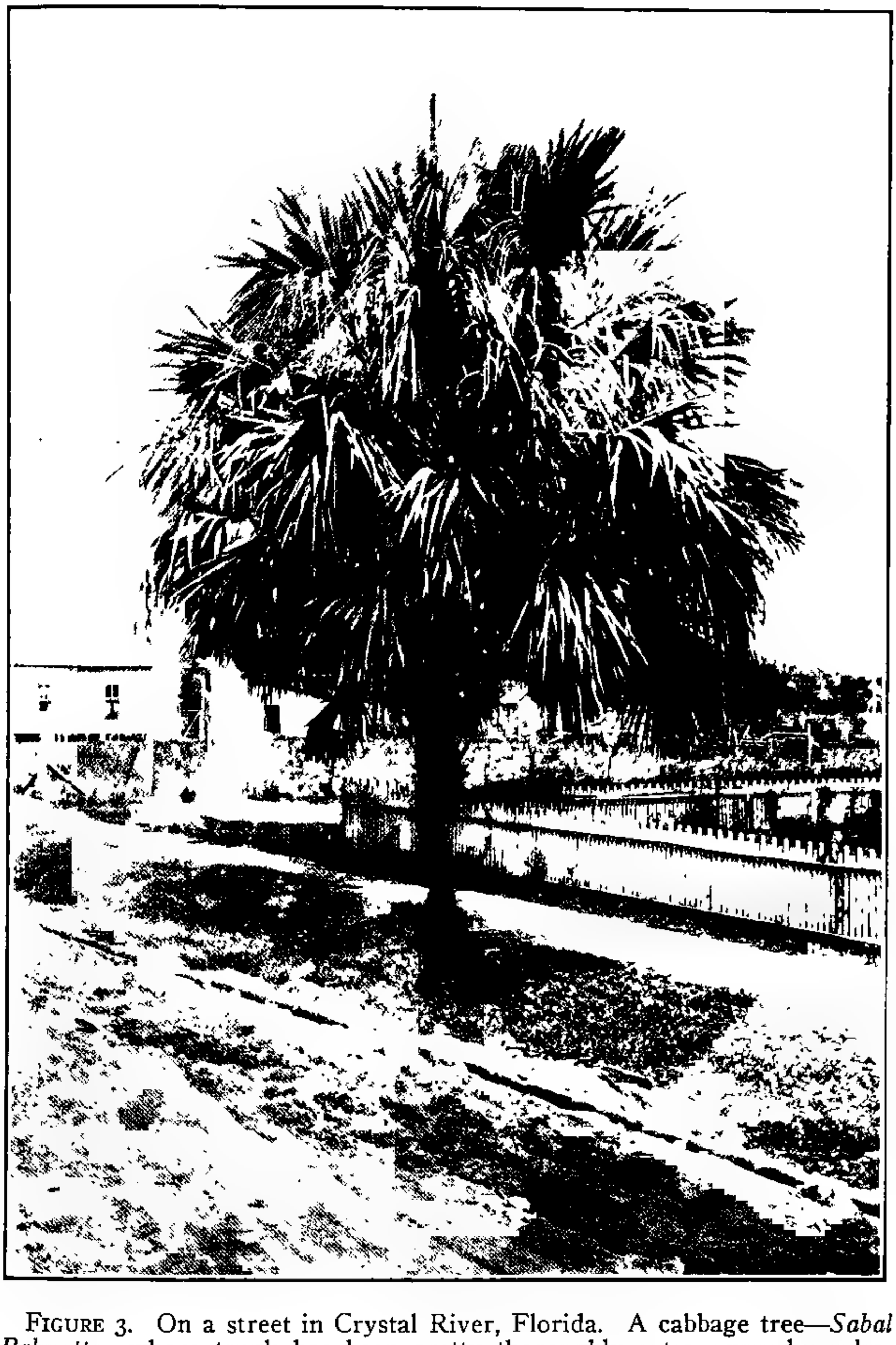

FIGURE 3. On a street in Crystal River, Florida. A cabbage tree—*Sabal Palmetto*—whose trunk has been pretty thoroughly eaten away by palm-borers. About two-thirds of the trunk had been destroyed when the photo was taken, and the work of destruction was still in progress. The trunk was protected from mechanical injury by a box, but the insects got in their work.

FIGURE 4. A section of the trunk of the cabbage-tree shown in FIGURE 3. The extensive damage to the diameter of the trunk did not have any detrimental effect on the large crown of leaves.

upper part of the trunk of a royal-palm felled by hurricane winds may be seen. This specimen is in Royal Palm Hammock, not far from the cabbage-tree shown in FIGURE 1. The trunk was over seventy-five feet tall when it stood erect. In Royal Palm Hammock these palms grow on plate rock with little or no soil in which to anchor, the main anchorage being the slightly and unevenly weathered surface of the one-time exposed rock. With no place to bury themselves, the roots are often largely aerial, piled up on one another in myriad layers, as shown in FIGURE 5. This exposed root-system is not the result of a vacillating water-table, as it is in the case of the cabbage-tree cited above, but of their peculiar local habit of living, to be explained presently, in relation to their associated plants and animals.

The royal-palm is a rapid grower and produces an amazing amount of tissue—stem, leaves, ferrule, and blades, flowers, and fruits—from apparently very little nourishment. With little or no natural soil in their habitat, they themselves make enough to live on. The rock on which they grow is constantly filled with capillary water. This the palm takes up through those roots that cling to the rock. After a palm gets a start and grows, the leaves fall periodically and decay about the base of the trunk. When it reaches the flowering stage, the flowers and fruits, borne in myriads, fall as do the leaves, and all this matter decays about the base of the trunk. This is the reason for the aerial or subaerial mass of roots shown in FIGURE 5, for they are at all times more or less buried in the mass of débris. As the débris decays, mycorrhizas doubtless appear to help the palm grow. Furthermore, rodents come to do their part. As they eat the interior of the fruits, they discard the hulls which soon change into humus, also supplying at the same time not a little manure, which is very advantageous to the growth of the plant. Thus the palm grows largely and not so indirectly by eating itself, and may prosper to tower high above its broad-leaved hammock associates.

As these palms rise many feet above the hammock roof they are exposed to the fury of hurricanes and sometimes topple over, as did the one shown in FIGURE 6, the root mass acting as a large disk with but one edge on the ground. When the tree fell, at least 80 per cent of the roots were pulled out of their anchorage, leaving only a small percentage to continue feeding the massive plant. Nat-

FIGURE 5. The base of a tall royal-palm—*Roystonea regia*—in Royal Palm Hammock, Dade County, Florida. The palm is growing on plate-rock. The roots spread out horizontally on the rock and into the humus and humus being created at the base of the trunk (here pulled away) from the tissues of fallen leaves, flowers, and fruits. The disk of roots is about 10 feet wide. This tree was over 100 feet tall. This area is now in the Everglades National Park.

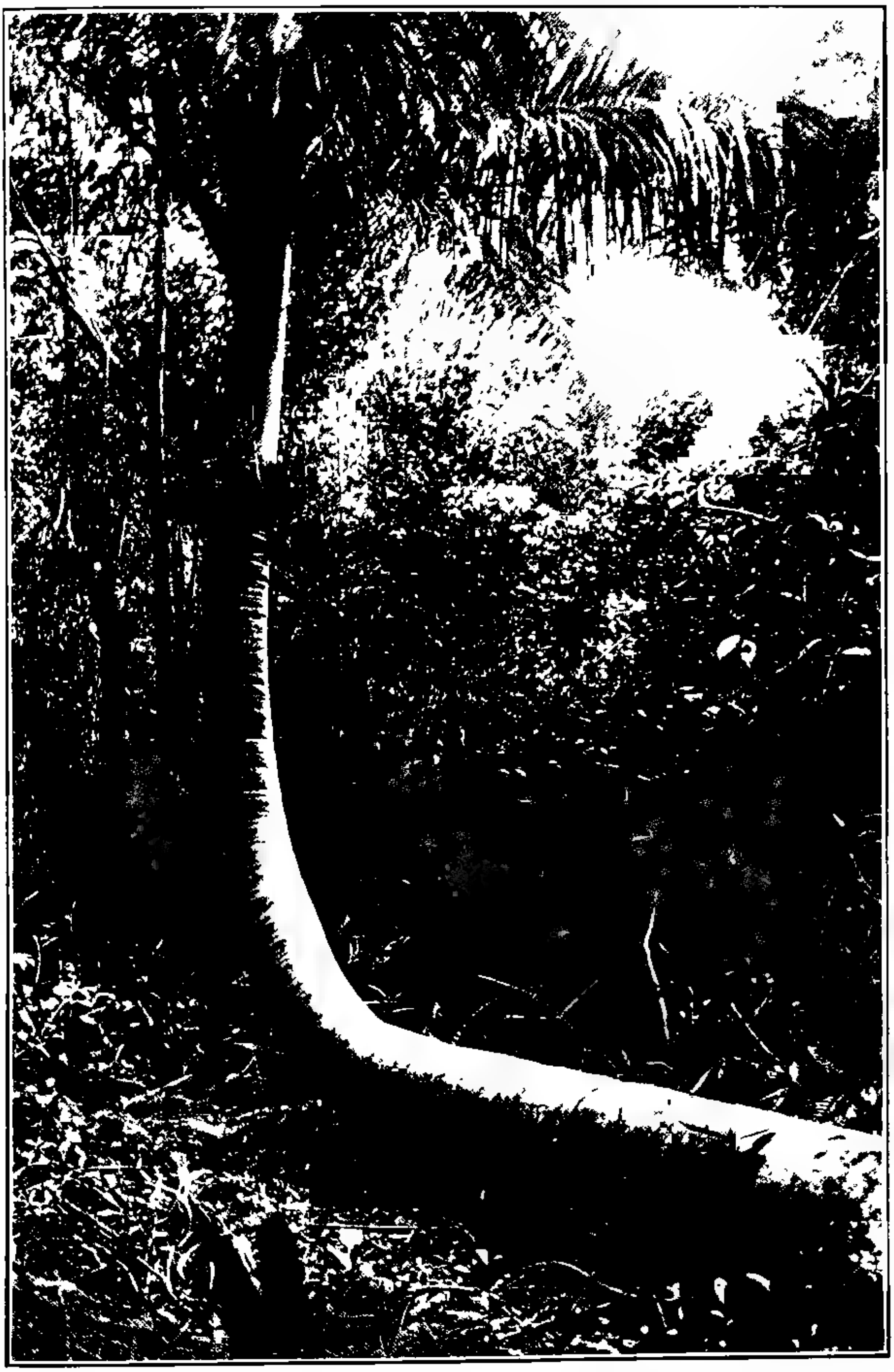

FIGURE 6. The upper part of a fallen royal-palm. In storms these tall palms with little grip on the plate rock topple over just as toy trees with flat, disk-like bases, at the same time exposing the root-system to the air, except for the few roots on one side left in contact with the rock. As may be seen in the print, the horizontal tip of the crown gradually curved upward into an erect position, and leaves, flowers, and fruits continued to grow.

urally, new roots began to form in company with those not pulled out, while those sticking up in the air became inactive. However, the loss of most of its root-system did not especially bother the palm in question. It continued not only to grow but to thrive. The bud strove to assume its natural erect posture, and after a few years succeeded. The reduced root-system is reflected in the more than normal tapering of the trunk below the leaf-sheaths. However, sufficient nourishment was provided to develop the inflorescence which is shown in immature form just below the ferrules of the leaves.

From the foregoing examples it seems that palms make certain tissues in excess of their needs under ordinary and extraordinary circumstances.

JOHN K. SMALL.

IT PAID TO TREAT THE LAWNS

Since the note on Japanese beetles in the October JOURNAL was written,[1] additional information on the subject has been literally unearthed by Dr. Dodge. The old story, often reported in State and Federal bulletins, that arsenate of lead helps to control Japanese beetles in lawns, gains fresh support from a recent sampling made since the larvae have developed from the eggs laid in August. There is no denying the conclusion that it paid to treat the lawns, and it seems apparent that it is now time to give them another treatment.

In April, 1932, in coöperation with Mr. H. C. Hallock, of the United States Department of Agriculture, one of our lawns was staked off in six strips, each 30 feet wide and running the whole length of this lawn. The first strip was treated with arsenate of lead, 10 pounds to 1000 square feet, the second with 15 pounds, and the third strip was left untreated, as a check. The arsenate for the two strips was applied as a spray and was washed in with water from a hose. The fourth strip was treated with 10 pounds per 1000 square feet and the fifth with 15 pounds, the arsenate being mixed with soil and the mixture spread on as evenly as was convenient. The sixth strip was again left untreated as a check.

On October 15, 1935, the fourth autumn season since the arse-

[1] Dodge, B. O. The Situation Regarding Dutch Elm-disease, the Japanese Beetle, and the Gypsy Moth at The Botanical Garden. **36**: 247–252. 1935.

nate was originally applied, 54 sample diggings were made to determine the number of larvae working in the different strips. The holes were one foot square and one foot deep. Three holes were dug in each of the six strips in three different lines across the lawn, the lines being about 100 feet apart. It was particularly desired to learn whether crab-grass to be found chiefly in the two untreated strips and elsewhere in the neighborhood was correlated in any way with the arsenate treatment. It was seen that wherever the beetles had not been killed and hence had destroyed the good grass, crab-grass had taken its place in abundance.

The following table gives the number of larvae in the eighteen sample diggings along each of the three lines across the lawn.

10 lbs.	15 lbs.	untreated	10 lbs.	15 lbs.	untreated
5, 0, 0	0, 0, 0	75, 0[a], 63	0, 2, 0	0, 0, 19[b]	77, 68, 60
6, 1, 2	5, 5, 9	53, 80, 67	1, 1, 0	1, 2, 0	0[c], 0, 2
5, 5, 0	0, 3, 9	30, 38, 66	0, 3, 0	0, 1, 0	61, 66, 7[d]

[a]—The location of this digging happened to be a spot where there was no grass, the soil being yellow and without vegetation, probably due to a fill in recent years.

[b]—This digging was practically on the line separating the untreated from the treated strips.

[c]—The three diggings in the untreated strip here showed only two larvae. This is no doubt due to the very dry soil near a hickory tree, where eggs would not be laid.

[d]—In the corner under a small maple tree.

It is clear from the data that the treatment was very effective. The presence of a few larvae in the treated strips might indicate that it is about time to make another application. Ten sample diggings made in nearby untreated lawns gave an average of 58 larvae for each cubic foot. In 1932 when the sample diggings were originally made there were very few Japanese beetle grubs, the larger percentage being larvae of the brown Asiatic beetle. The reverse is now the case, the Japanese beetle larvae predominating.

A GLANCE AT CURRENT LITERATURE[1]

The latest publication in that excellent project of reproducing important original botanical papers in facsimile is "Miscellaneous Papers Regarding Japanese Plants," by C. P. Thunberg. Thun-

[1] All publications mentioned here—and many others—may be found in the library of The New York Botanical Garden, in the Museum Building.

berg's "Flora Japonica" has already appeared through this same Japanese firm, Shokubutsu Bunken, Kanko-Kai, Tokyo. The present volume includes a collection of scattered theses, with illustrations, giving technical descriptions of the native flora.

* * * *

Grasses and other plants brought from Asia to use on the Great Plains of North America to prevent erosion are now being propagated in nurseries and greenhouses through the West, according to a report in *Science* for October 11. As soon as sufficient stock has been developed, they will be tested by the United States Department of Agriculture in regions where they are needed.

The same issue of *Science* tells how new trees are now seen from a distance on inaccessible mountain slopes in Hawaii, as a result of seeds being scattered from airplanes ten years ago. Areas thus planted had previously been denuded by forest fires.

* * * *

A biography and critical estimate of the work of Hugo de Vries, the Dutch biologist, who recently died at the age of 87, appears in *The Journal of Heredity* for August. De Vries is most celebrated for his mutation theory of evolution, which he developed largely from experiments in the Oenotherae, and which challenged Darwinism and led to developments of prime importance in the progress of biological thought. De Vries likewise altered the conception of cell mechanics, originated a method for determining molecular weights of substances, and conducted pioneer researches in the action of osmotic membranes in living cells. A bibliography of his works is appended.

* * * *

Several unusually interesting articles on ferns are featured in recent magazines. In *The American Fern Journal* for July–September, Rogers McVaugh has a paper on "Spores of Some Northeastern Ferns" with line drawings and an artificial key. The conclusion is that spore characteristics are not reliable for distinguishing species, however authentic for separating genera. In the same issue "A List of Varieties and Forms of the Ferns of Eastern North America" by C. A. Weatherby is continued, through Botrychium, Ophioglossum, and Osmunda. In *The National Horticultural Magazine* for April, Edith A. Roberts writes a well-illustrated article on "American Ferns: How to Grow and Use Them."

Maps are included, showing the distribution of ferns in the United States. *The Tokyo Botanical Magazine* for June describes and pictures thirteen species and varieties of Dryopteris native to Japan, with an interesting chart.

* * * *

"Clematis for the Rock Garden" is the title of a paper reprinted in pamphlet form from the September *Bulletin* of the Garden Club of America, by J. E. Spingarn. Low herbaceous species are especially mentioned; also two slender climbers from the southern states, *Clematis texensis* in its brighter-colored forms, and *C. crispa*, whose flowers are pale-pink or lavender. Dr. Spingarn follows this article with one on "The Clematis Lover's Debt to Japan."

* * * *

Practical pointers on where to look for the trouble when garden perennials do not prove hardy are briefly given by Stephen F. Hamblin in *Lexington Leaflets* for September 28. Soil—both mechanical and chemical condition, moisture, sun, shade in summer, shade in winter, snow, thawing, wind, and general climatic conditions, as well as the habit and natural peculiarities of the plant, its health, and the region from which it came, are factors mentioned for their effect on hardiness.

* * * *

Farm Research, the quarterly paper issued by the New York Agricultural Experiment Station in Geneva, entered its second year of publication October 1 with 12 pages instead of the original eight. It is hoped in this paper, according to a statement addressed to the readers in the initial number, to "make clear to the farm constituency of the Experiment Station just what is being done with the funds appropriated by the State of New York for research at Geneva and just how you can best realize on this investment in your Experiment Station." The latest issue contains informative articles on the commercial production of sauerkraut, detection and treatment of bean mosaic, the history of the hop industry in New York State, fall planting of peonies, pollination of grapes, cheese-making, fruit-breeding, nitrogenous bacteria in the soil, storage of winter squash, problems of dairy scientists, and insect problems for McIntosh apple growers in the Champlain valley.

Three thousand men are now at work on a $2,500,000 program to fight the Dutch elm-disease, according to the September *Forestry News Digest,* published by The American Tree Association. The work is being conducted largely in New York State, New Jersey, and Connecticut, but scouting will also be done in Pennsylvania, Tennessee, Kentucky, and Louisiana.

Among other forestry notes in this issue are a statement that four million acres of denuded and cutover land in the north central region are to be planted with trees in the next ten years, 375,000,000 trees to be set out every year; that 120,000,000 trees, the largest number ever seeded in a government forest nursery, are now growing in the Chittenden Nursery in Michigan for future planting in Manistee National Forest; and that seeds of certain types are now being sown in large numbers by machinery, with a view to speeding up production of forest trees.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

The fourth year of the Science Course for Professional Gardeners, offered by The New York Botanical Garden to equip the student gardeners of the institution and experienced gardeners, nurserymen and florists from outside with the sciences underlying their work, opened September 30 with about 65 students enrolled. Classes meet every Monday evening for twelve weeks, then resume after Christmas and continue till March.

Dr. W. H. Camp is teaching the 30 or more first-year students systematic botany. Other instructors are the same as in previous years: Dr. Forman T. McLean, plant morphology and, the second term, plant physiology to the beginners, meanwhile giving the second-year students a course in soils and fertilizers; Dr. E. P. Felt, of the Bartlett Tree Research Laboratories, entomology; Dr. A. B. Stout, plant breeding, and Dr. B. O. Dodge, plant pathology.

The course is conducted in the rooms of the Horticultural Society of New York.

Forty-three new seedless grapes set fruit this year for the first time, Dr. A. B. Stout reported last month upon returning from Geneva, where he is working with the New York Agricultural Ex-

periment Station in the breeding of new hardy seedless varieties. Several of these are promising types, he says, for commercial culture, and are to be propagated as rapidly as possible. In all, eighty varieties have borne seedless fruit in the experiments at Geneva.

Dr. W. H. Camp has been appointed an assistant curator at the Botanical Garden, coming here from Ohio State University, where he has been teaching botany since 1927. Especially interested in comparative anatomy, Dr. Camp has done extensive field-work throughout the United States, and last year he spent considerable time at the Garden, determining species on which he was working in the Vacciniaceae. He is interested also in the Fagaceae and Lemnaceae.

Dr. Fred J. Seaver, Curator of the fungi, recently returned from Europe where he had been attending the International Botanic Congress in Amsterdam, Holland, as a delegate from The New York Botanical Garden and also from the Mycological Society of America. He was one of three Americans to be appointed a member of the international committee on the nomenclature of the fungi. Following the meeting he spent a few days in Leiden, studying the historic collection of Persoon, one of the pioneer European mycologists, and went botanizing over the sand dunes of Holland. Previously, while in Brussels he visited the Botanical Garden and other institutions of scientific interest. In addition to attending the scientific meetings Dr. Seaver took this opportunity to publicize, with substantial results, *Mycologia,* the official organ of the Mycological Society of America.

Dr. David H. Linder, in charge of the Farlow Herbarium at Harvard University, recently spent a few days at the Garden, looking over specimens of fungi preparatory to a monograph of some of these forms. He took a collection of unnamed material back to Harvard to be critically studied and determined. He was accompanied by Rafael A. Toro, of the University of Puerto Rico, who is also conducting critical studies in some of the parasitic fungi of the tropics.

Miss Clyde Chandler, Technical Assistant at The New York Botanical Garden, visited the botanical laboratories of Cornell Uni-

versity at Ithaca, N. Y., and the State Agricultural Experiment Station at Geneva last month to observe especially the technique of research in cytology being done at these two institutions by Dr. Barbara McClintock and by Dr. Bernhard R. Nebel and Dr. Mabel L. Ruttle-Nebel.

Miss Alice Eastwood, who has charge of botanical work for the California Academy of Sciences, stopped at the Garden last month on her way back from Europe, where she attended the International Botanic Congress in Amsterdam.

W. W. Eggleston, assistant botanist for the United States Forest Service and the Bureau of Plant Industry, was also an October visitor at the Garden. He was at one time a research scholar at the Botanical Garden.

Dr. E. J. Schreiner, formerly a student at the Botanical Garden and more recently co-worker with Dr. A. B. Stout in breeding fast-growing poplars for reforestation and pulp-production, has gone to the Tennessee Valley Authority to take charge of tree-breeding work. He will be working particularly with nut trees.

Dr. A. C. Smith, assistant curator, and Mrs. Smith, after attending the International Botanic Congress in Holland and traveling through Finland and the Scandinavian countries, are now in London, where he is spending two months doing taxonomic research work at the Royal Botanic Gardens at Kew.

Continuing the monograph on the genus Carex by the late K. K. McKenzie, part 6 of volume 18 of North American Flora, comprising pages 313–392, has appeared this fall.

More than 2,000 cone-bearing trees and shrubs, comprising more than 250 species and varieties from all parts of the world, have been presented to the Morris Arboretum of the University of Pennsylvania, by Colonel Robert H. Montgomery, a member of the Board of Managers of The New York Botanical Garden.

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Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, tulips, lilacs, irises, peonies, roses, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical and horticultural literature, comprising nearly 45,000 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the autumn, winter and spring.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. Applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
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Annual Member	annual fee	10
Garden Club Membership	annual fee for a club	25

Contributions to the Garden may be deducted from taxable incomes. Bequests may be made in the form of securities, money, or additions to the collections. The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ———.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

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All requests for further information should be sent to

THE NEW YORK BOTANICAL GARDEN

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VOL. XXXVI DECEMBER, 1935 No. 432

JOURNAL
OF
THE NEW YORK BOTANICAL GARDEN

BEGONIA SOCOTRANA
T. H. EVERETT

THE 1935 DAHLIA BORDER
MARSHALL A. HOWE

A HARDY FUCHSIA FOR THE GARDEN
HENRY TEUSCHER

WINTER SERIES OF LECTURES AT THE GARDEN

A GLANCE AT CURRENT LITERATURE
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NOTES, NEWS, AND COMMENT

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JOURNAL
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The New York Botanical Garden

VOL. XXXVI DECEMBER, 1935 NO. 432

BEGONIA SOCOTRANA

During the present month (December) and in January a few flowering specimens of *Begonia socotrana* will be exhibited in the Display Greenhouse in Conservatory Range I, these representing the increase obtained from a single small plant received from Mrs. Bessie Buxton early in 1934.

Begonia socotrana is of especial interest to horticulturists in that it is one of the parents of our two most important groups of winter-flowering hybrids, the so-called Christmas Begonias, of which the type is Gloire de Lorraine, and the large-flowered kinds which are seen so well exhibited at November flower shows and are represented by such varieties as Emita, Exquisite, and Emily Clibran.

For the introduction of this species into cultivation we are indebted to the late Sir Isaac Bailey-Balfour who, in 1880, secured plants from their home in Socotra, a hot, dry island located off the coast of Arabia in the Indian Ocean and described by Sir Joseph Hooker as "one of the last places in the world in which a Begonia could have been expected to occur." Following its debut in gardens, *B. socotrana* quickly became popular and hybridists early recognized its possibilities. Today the magnificence of its hybrid progeny is such that as decorative plants they completely overshadow the species in importance, yet to the true plant lover a beauty and charm is apparent in the type which is lacking in the showier and grosser hybrids, and it is to be regretted that it is not more frequently seen in cultivation.

Begonia socotrana forms tight clusters of pale-green resting buds

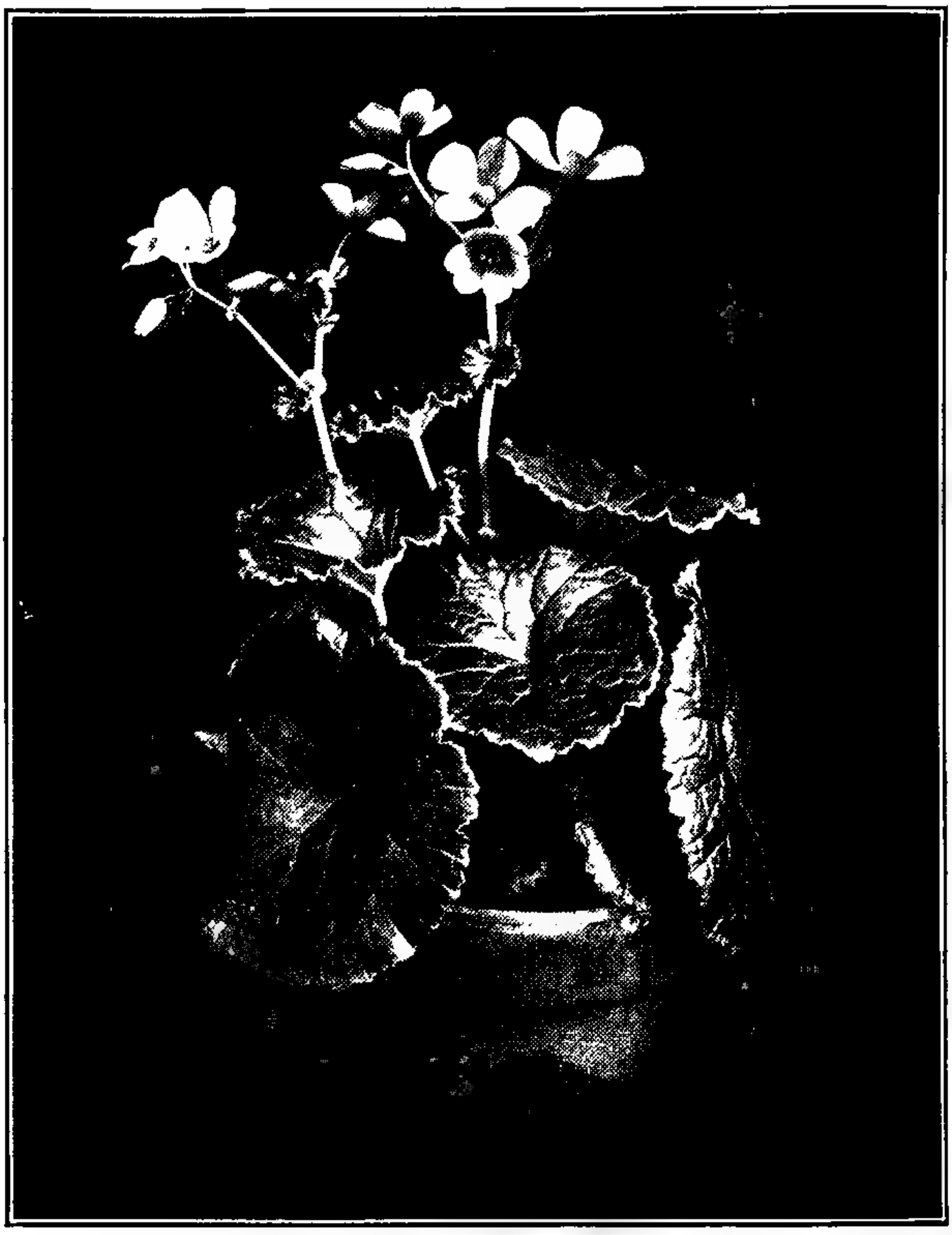

FIGURE 1. *Begonia socotrana,* an important parent of many of today's leading hybrid Begonias.

or bulblets on the surface of the ground and from these at the end of the dormant season the stout and succulent annual growths are produced. The stems are erect and sparingly branched and each bears from one to three orbicular, peltate leaves of handsome appearance, the largest measuring six or seven inches in diameter. The center

of each leaf is strongly depressed. The upper surface is glossy and deep green in color and is usually glabrous, while the under side is paler and, like the stems and petioles, is sparsely hairy, especially along the nerves. The leaf-margins are crenate and ciliate. Carried well above the foliage, the inflorescence consists of several flowers, all of which are staminate except the terminal one of each cyme-branch, which is female. The flowers are about two inches in

FIGURE 2. One of the winter-flowering hybrids resulting from crossing *Begonia socotrana* with tuberous species from South America.

diameter and are of a clear rose-pink color ; the males each have four broad petals, two of which are rather smaller than the others, while the pistillate flowers are six-petaled and are of regular appearance. The bright yellow stamens and styles in the male and female flowers respectively add much to their beauty.

Propagation of this species is most easily effected by dividing the bulblets into clusters of four or five when the plants are started at the commencement of the growing season. A more complete division often results in loss. August or early September is the correct time to give this matter attention and the divisions are potted in small receptacles in a mixture consisting very largely of leaf-mold and sharp sand with a little loam added. The newly potted plants are placed in a warm propagating case, and a close atmosphere is maintained.

Watering must done with care at first, but as roots are developed and throughout the growing season, sufficient quantities must be applied to maintain the soil at all times in a moist condition. Not until the plants occupy the receptacles in which they are to flower must they be allowed to become pot-bound, but successive shifts should be small, transfers being made from a three- to a four-inch pot, from a four-inch to a five, and so on. A soil containing a large proportion of leafmold, some dried cow-manure broken to the size of peanuts, sharp sand, and broken charcoal in addition to good fibrous loam is most appreciated and it should be pressed but moderately firmly about the roots. From the time the final pots become well filled with roots until the flowers commence to open, semi-weekly feeding with dilute soot-water and liquid cow-manure is beneficial.

Begonia socotrana should be grown under tropical greenhouse conditions, for it is seen at its best only when given a somewhat higher temperature than is desirable for the Christmas Begonias. Shade from bright sunshine is necessary and a humid atmosphere must be maintained, but spraying water on the leaves should be avoided, as it is apt to collect and remain in the funnel-shaped depressions. The flowering season is prolonged if the plants, when in bloom, are afforded a lower temperature and drier atmosphere. The stems and leaves being very brittle, the plants require careful handling at all times.

FIGURE 3. Lady Mac, one of the most popular of the Christmas Begonias, with *B. socotrana* in its parentage.

After flowering, every effort is made to retain the foliage as long as possible, but as the leaves and stems naturally die away and the plants enter the dormant stage, supplies of water are gradually reduced and finally withheld altogether and the plants are rested until the following August.

The first hybrid Begonia to be introduced having *B. socotrana* as a parent was the variety John Heal, which resulted from fertilizing *B. socotrana* with pollen from a crimson-flowered tuberous variety known as Viscountess Doneraile. Only one seed germinated and the progeny of the plant so raised was the first to be distributed of that splendid large-flowered section produced by using the Andean

tuberous-rooted Begonias and *B. socotrana* as parents. John Heal was raised by Messrs. Veitch of England. It first flowered in 1885 and was placed on the market three years later. In the years which followed Veitch sent out many fine varieties belonging to this section, including Adonis, Winter Gem, Emita, and Mr. Heal. At first many growers found difficulty in keeping their plants after flowering and frequently were unable to maintain stocks, but with increased experience this became more easily possible, and it seems likely that later varieties are less troublesome in this respect than were some of the earlier kinds. Together with the Veitches, Messrs. Clibran of England have been responsible for the raising and introduction of practically all the winter-flowering hybrids of this type grown today, some of the finest of which are Optima, Mrs. Clibran, Fascination, and Exquisite.

Another milestone in Begonia history was achieved in 1892 when Messrs. Lemoine of France succeeded in crossing *Begonia socotrana* with the South African *B. Dregei* and produced Begonia Gloire de Lorraine, the first of the Christmas Begonia varieties. Gloire de Lorraine was introduced in 1893 and was followed by such varieties as Turnford Hall and Mrs. Leopold de Rothschild, and later by the American-raised Mrs. Petersen and Glory of Cincinnati. This last named variety was raised by crossing one of the sports of Gloire de Lorraine with *B. socotrana* and it very distinctly shows the influence of *B. socotrana* in its habit of growth. Two of the most popular varieties of this section in cultivation today are Melior and Lady Mac.

T. H. Everett.

THE 1935 DAHLIA BORDER

Probably due in large measure to physical injuries to the soil as the result of the construction of a steam trench during the preceding winter and spring, and to a dry August, the dahlia season at The New York Botanical Garden was slow and somewhat discouraging during a considerable part of its existence. However, the arrival of the first killing frost was so long deferred—until the record-breaking

FIGURE 1. A native Mexican dahlia—a yellow-flowered *Dahlia coccinea* —grown in The New York Botanical Garden during the season of 1935, from a tuberous root obtained the preceding November from the region of Uruapan, Michoacán. Miss Storm writes that she did not see flowers in actual organic connection with these tuberous roots, but that detached flowers brought to her with the roots were of the usual Chinese red or crimson color.

date of November 23—that nearly all of the plants reached a flowering size and the Border enjoyed a full month of glorious bloom. Three weeks of "Indian summer" mildness helped to perfect buds that, in late October, were never expected to reach blossoming size. On the whole, with the coöperation of the weather man, the 1935 dahlia season ranked among our most successful. On the afternoon of October 13, the first field day of the "Radio Garden Club" (Tuesdays and Fridays throughout the year, WOR) helped to swell the usual crowd of Sunday visitors. On that afternoon an informal talk on dahlias and their culture was given in the presence of the dahlias themselves.

The main collection contained the usual number of plants—about 1100—and a rather unusual number of varieties—about 500—including an especially large number of unnamed seedlings. Among the seedlings, some of the most outstanding were contributed by:

Hillcrest Dahlia Gardens, Fairmont, W. Va.; Success Dahlia Garden, 171 Ferry St., Lawrence, Mass.; Albert Parrella Dahlia Garden, 3380 Ely Ave., Bronx, New York, N. Y.; Dr. Bruce P. Preas, Rockville Center, N. Y.; Laurel Dahlia Gardens, Laurel Md.; Sanhican Gardens, Trenton, N. J.; Golden Rule Dahlia Farm, Lebanon, Ohio; Lloyd's Dahlia Gardens, Mays Landing, N. J.; Misses Elsie and Mary Williams, Connersville, Ind.; Pomeroy Dahlia Gardens, 1222 26th Ave., N., Seattle, Wash.; Hillside Farm, Austinburg, Ohio; George Eberle, 164 Martine Ave., Fanwood, N. J.; H. M. Blamer, Wellston, Ohio; W. J. Etherington, 125 Lexington Ave., Westwood, N. J.; A. H. Schlesinger, 12 Oldis St., Rochelle Park, N. J.; Richard Vanderheid, 686 Lafayette Ave., Hawthorne, N. J.; Clyde R. Jeffords, 161–43 86th Ave., Jamaica, N. Y.; Chappaqua Dahlia Gardens, Chappaqua, N. Y.

Among the other contributors of roots or green plants were Parkway Dahlia Gardens, 1012 E. 178 St.; Dahliadel Nurseries, Vineland, N. J.; C. Louis Alling, 251 Court St., West Haven, Conn.; W. E. Birrell & Sons, Summerville, Ontario; Louis E. Bedard, 72 King Edward Ave., Toronto, Canada; Bolsa Dahlia Gardens, 197 Oakdale Ave., Mill Valley, Calif.; F. A. Greenough, 25 French St., Braintree, Mass.; J. A. Kemp, Little Silver, N. J.; Ruschmohr Dahlia Gardens, 52 South Kensington Ave., Rockville Center, N. Y.; Almy's Supreme Dahlias, Tiverton, R. I.; Mad River Gardens, Urbana, Ohio; Sagamore Gardens, 162 Elm St., Everett, Mass; Alice Meussdorffer, 487 Hanover St., San Francisco, Calif.; Burnett Bros., 92 Chambers St., New York, N. Y.; Harry Hunt, Bernardsville, N. J.; Vincent Sigismondi, 768 Palisade Ave., Teaneck,

FIGURE 2. A part of the Dahlia Border at The New York Botanical Garden, October 22, 1935.

FIGURE 3. Dahlias—mostly "Nannie Sine"—at the Botanical Garden on November 13, 1935. They persisted until November 19, when the roots were lifted without waiting for the tops to be seriously damaged by frost.

N. J.; Salem Dahlia Gardens, 236 Grant St., Salem, N. J.; Chautauqua Dahlia Fields, Maysville, N. Y.; A. A. Tower, R. 1, Arlington, Wash.; Lee's Dahlia Gardens, University Place, Tacoma, Wash.; Mrs. Ola V. Tennant, R. 3, Fairview, W. Va.; Mrs. Jno. C. Maxwell, Brevard, N. C.; S. E. Taylor, Morgantown, W. Va.; Thomas L. Galvin, 4 Bedford St., Peabody, Mass.; M. G. Tyler, 1660 Denver Ave., Portland, Ore.; The Seven Acres, Stoneham, Mass.; F. D. Sanborn, 2619 Kingston Road, Cleveland Heights, Ohio; Peter Henderson & Co., 35 Cortlandt St., New York, N. Y.; R. W. Petrie, Gardena, Calif.; Glenn T. Mack, 173 Merced Ave., San Francisco, Calif.; Dr. H. Trossbach, Bogota, N. J.; Premier Dahlia Gardens, 31 Mertz Ave., Hillside, N. J.; C. Betscher, Dover, Ohio; Mrs. Ida L. Chase, Milan, Mich.

A feature of the 1935 display was the presence of a large number of the newer and better English, French, Dutch, German, and Czechoslovakian varieties, given chiefly by W. E. Birrell & Sons, Summerville, Ontario; L. E. Bedard, Toronto; and the Parkway Dahlia Gardens, 1012 E. 178th St., New York. Another feature was several plants grown from seeds and tuberous roots of "really wild" dahlias collected the previous autumn by Miss Marion Storm at an elevation of about 7,000 feet near Uruapan, Michoacán, Mexico, and considered to represent the native species known as *Dahlia coccinea* Cav. Two plants grown from seed in the Botanical Garden produced crimson-scarlet flowers characteristic of the species, while a third plant, grown from a tuberous root, produced only lemon-yellow flowers. Miss Storm writes that plants with yellow flowers are of occasional occurrence in the region of Uruapan and that, in one case, she saw on one and the same plant, transported from the mountains, an orange flower, one that was pale yellow, and one that was half red and half deep yellow, besides flowers of "the usual Chinese red" or "almost crimson." So it is possible that color in "really wild" dahlias may be scarcely more constant than in the cultivated garden hybrids.

MARSHALL A. HOWE.

A HARDY FUCHSIA FOR THE GARDEN

The pretty little shrub known as *Fuchsia magellanica* can, perhaps, not compete in beauty with the many large-flowered garden-hybrids of Fuchsia which we are wont to cultivate in pots, to set them outside only during the summer. But, as the accompanying picture shows, it is attractive enough to be well worthy of a place in our gardens and, in addition, it is hardy enough to winter outdoors. It is true that even this Fuchsia is likely to be killed to the surface of the ground during the winter, but that may happen also to our beloved Butterfly-bush (*Buddleia Davidii*), which nevertheless enjoys great popularity. Besides, with a light covering the rootstock of *Fuchsia magellanica* is sure to survive the severest winter we may ever experience in the vicinity of New York, and in the spring it will throw up new shoots which will flower from midsummer until late in October.

This species, with its several varieties, has a rather wide distribution in South America, extending from Peru to Chile, Tierra del Fuego and the Falkland Islands. It was discovered in 1768 by Commerson, who first observed it growing quite abundantly in woods on the Magellan Mountains of southern Chile—whence the name *magellanica*. The genus was known before this species was discovered and was named by Linnaeus in honor of the German physician and botanist Leonard Fuchs, who lived from 1501 to 1565. While English dictionaries, unfortunately, sanction the pronunciation of "Fuchsia" as though it were written "Fewsia," the correct pronunciation of the same word when used as the generic name of the plant is "Fooksia."

As far as is known to us, *F. magellanica* is offered for sale in this country only by one Californian nursery. That it is a satisfactory garden plant also here in the eastern states seems to be hardly known. To introduce it and to give it a fair test, The New York Botanical Garden has raised several hundred plants of it which we expect to distribute next spring as far as possible to those members of the garden who desire it.

Good, loose garden soil with southern or western exposure and full sun will suit the wants of this plant.

HENRY TEUSCHER.

A spray of *Fuchsia magellanica*, from South America, a small hardy garden shrub, specimens of which the Botanical Garden hopes to make available to its members next year.

WINTER SERIES OF LECTURES AT THE GARDEN

Saturday afternoon lectures to be delivered in the lecture hall of the Museum Building during December, January, and February are listed below. Illustrated by lantern slides and otherwise, the series is free to the public. Doors closed at 3:30; late-comers are admitted at 3:45; the lectures close promptly at 4:30 p. m.

December 7. "A Winter in Bermuda," Dr. Fred J. Seaver, Curator.
December 14. "Magic Haiti," Mr. W. Stephen Thomas, Explorer.
December 21. "Evergreens," Mr. Leonard Barron, Horticultural Editor.
January 4. "Garden Photography," Miss Fleda Griffith, Artist and Photographer.
January 11. "Problems of the Small Garden," Professor Hugh Findlay, Columbia University.
January 18. "Insectivorous Plants," Dr. John Hendley Barnhart, Bibliographer and Administrative Assistant.
January 25. "Philippine Life," Dr. Forman T. McLean, Supervisor of Public Education.
February 1. "Hunting Alaskan Heathers," Dr. W. H. Camp, Assistant Curator.
February 8. "The Origin and Improvement of Cultivated Plants," Dr. A. B. Stout, Director of the Laboratories.
February 15. "Diatoms, Microscopic Beauties," Dr. Marshall A. Howe, Director.
February 29. "Gardens from Seed," Mr. T. H. Everett, Horticulturist.

A GLANCE AT CURRENT LITERATURE*

In Thomas Tusser's "Five Hundred Points of Good Husbandry" published in England in the middle sixteenth century, some entrancing lists of flowers, herbs, and vegetables are given. The book, which is largely in verse, is described in the October 26 number of *The Gardeners' Chronicle*. Among the plants mentioned are "Daffadondillies," "Holiokes," "Pauncies or hartsease," "Spennage," "Oyneons," and "Bleets or beets."

* * * *

Flowering trees for parks and gardens are the subject of a useful article in *The Gardeners' Chronicle* for November 2. Both this and the preceding issue relate stories of recent plant exploration in Serbia and Turkey in Asia.

* * * *

Shrubs to grow for fragrance are described in *Horticulture* for November 1, among them some azaleas and the strawberry-bush, *Calycanthus floridus*.

*All publications mentioned here—and many others—may be found in the Library of The New York Botanical Garden, in the Museum Building.

In the series called "Seeking Out the Best" now running in the *Florists Exchange,* P. J. Van Melle describes on November 16 three charming Dianthus species, showing them in a rock-garden setting. One is *D. alpinus,* another *D. superbus,* and the third a hybrid between the two. He also gives cultural directions for the group. In the issue of Nov. 9, T. H. Everett describes two especially attractive species of Oxalis which are being grown at the Botanical Garden. One is *O. Bowieana,* which has bloomed all summer and well into autumn in the rock garden; the other *O. hirta,* which is thriving in the greenhouse.

* * * *

Among many plants described in *Contributions* from the Biological Laboratory of the Scientific Society of China, volume 9, number 3, a new Clematis is of interest. Discovered in Kweichow, it has been named *Clematis kweichowensis,* and is said to be related to *C. repens* and *C. otophora.* It has small single flowers with hairy stamens and densely tomentose sepals.

* * * *

Dr. E. D. Merrill's "A Commentary on Loureiro's 'Flora Cochinchinensis'," which is an attempt to identify in terms of present-day botanical knowledge the uncertain plants in this highly important 18th century work, has appeared as part 2 of volume 24 (new series) of the *Transactions* of the American Philosophical Society.

* * * *

Recent literature on mosses and on lichens is listed in detail in *The Bryologist* for May and June by M. Fulford and G. P. Anderson.

* * * *

Some of the newer peonies are fully described in the September number of the *Bulletin* of the American Peony Society. George W. Peyton, who has compiled the list, promises more in future issues.

* * * *

"Wild Flowers of Newfoundland" is the title of a vest-pocket series of books of which part 3 has just been issued. Mrs. A. M. Ayre is author and artist of the series, for which M. L. Fernald

has provided the botanical names. The present volume deals chiefly with the families containing the orchids, willows, buttercups, mustards and roses.

* * * *

Comparing the flora around Kinderhook, N. Y., in Columbia County, with a report of it made just a century ago, Rogers McVaugh has discovered that seven-eighths of the plants are the same there today as in 1835. He writes about his investigation in the November *Bulletin* of the Torrey Botanical Club.

CAROL H. WOODWARD.

NOTES, NEWS, AND COMMENT

Dr. A. B. Stout addressed an audience of nearly 900 in Lancaster, Pa., November 7, on "Sterilities in Flowering Plants." The occasion was the meeting of the local branch of the American Association for the Advancement of Science.

When the A. A. A. S. meets in St. Louis, Mo., after Christmas, Dr. B. O. Dodge will give an address as retiring vice-president of Section G (Botany), speaking on "Reproduction and Inheritance in Ascomycetes," and will also speak as retiring president of the Mycological Society of America at the annual dinner of the group.

At the first autumn conference of the Scientific Staff and Registered Students of the Garden, November 15, Dr. F. J. Seaver reported on the International Botanic Congress in Amsterdam and Dr. E. H. Fulling showed motion pictures which he took last summer in Germany and Holland.

Dr. E. D. Merrill paid his first visit to the Garden since taking his new post at Harvard University the week-end of November 9–11.

Concluding the monumental work of the late K. K. Mackenzie on the genus Carex, volume 18, part 7, of *North American Flora* has just been issued. This brings up to within the last few years

all knowledge of the 533 species of Carex of North America, Central America, the West Indies, and Greenland. The elaborate citation of synonyms, for which this work is noteworthy, means that existing literature on the genus, from 1753 almost to the present day, has been completely covered.

Roses which were blooming outdoors in abundance at the New York Botanical Garden November 8 won for the institution a bronze medal when a large collection of them was exhibited at the Fall Flower Show of the Horticultural Society of New York, November 8–10, at the American Museum of Natural History.

Gourds which were exhibited at the Fall Flower Show by Miss Helen M. Tillinghast were put on display in the lobby of the Museum Building immediately after the downtown show. Other recent exhibits in the Museum Building have included flower photographs by Miss Evelyn Pitshke, oil paintings by members of the Bronx Artists' Guild, and mounted flowering plants and ferns preserved in their natural form and color through a process developed by Mr. G. Russell Fessenden. A larger collection of the fresh-appearing mounted plants will be shown again in the Museum Building in January.

About 40 men in the Park Department of the City of New York, by special request of the Park Commissioner, were allowed to join members of the Botanical Garden in the six-weeks' course in practical horticulture given by the Garden on Wednesday evenings at the American Museum of Natural History. The closing lecture in the course, which was conducted by T. H. Everett, took place November 20. Subjects covered in the six addresses, which were amply illustrated with a special series of lantern slides showing gardening operations in detail, included preparation of soil, sowing of seeds, vegetative propagation, grafting, pruning, training, planting, watering and feeding of garden and indoor subjects. Each session was followed by a question-and-answer period.

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* Index prepared by Miss Rosalie Weikert.

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Some of the leading features of The New York Botanical Garden are:

Four hundred acres of beautifully diversified land in the northern part of the City of New York, through which flows the Bronx River. A native hemlock forest is one of the features of the tract.

Plantations of thousands of native and introduced trees, shrubs, and flowering plants.

Gardens, including a new rock garden, a large rose garden, a perennial border, small model gardens, and other types of plantings.

Greenhouses, containing thousands of interesting plants from America and foreign countries.

Flower shows throughout the year—in the spring, summer, and autumn displays of daffodils, tulips, lilacs, irises, peonies, roses, water-lilies, dahlias, and chrysanthemums; in the winter, displays of greenhouse-blooming plants.

A museum, containing exhibits of fossil plants, existing plant families, local plants occurring within one hundred miles of the City of New York, and the economic uses of plants; also historic microscopes.

An herbarium, comprising more than 1,700,000 specimens of American and foreign species.

Exploration in different parts of the United States, the West Indies, Central and South America, for the study and collection of the characteristic flora.

Scientific research in laboratories and in the field into the diversified problems of plant life.

A library of botanical and horticultural literature, comprising nearly 45,000 books and numerous pamphlets.

Public lectures on a great variety of botanical topics, continuing throughout the autumn, winter and spring.

Publications on botanical subjects, partly of technical, scientific, and partly of popular, interest.

The education of school children and the public through the above features and the giving of free information on botanical, horticultural and forestral subjects.

The Garden is dependent upon an annual appropriation by the City of New York, private benefactions, and membership fees. Applications for membership are always welcome. The classes of membership are:

Benefactor	single contribution	$25,000
Patron	single contribution	5,000
Fellow for Life	single contribution	1,000
Member for Life	single contribution	250
Fellowship Member	annual fee	100
Sustaining Member	annual fee	25
Annual Member	annual fee	10
Garden Club Membership	annual fee for a club	25

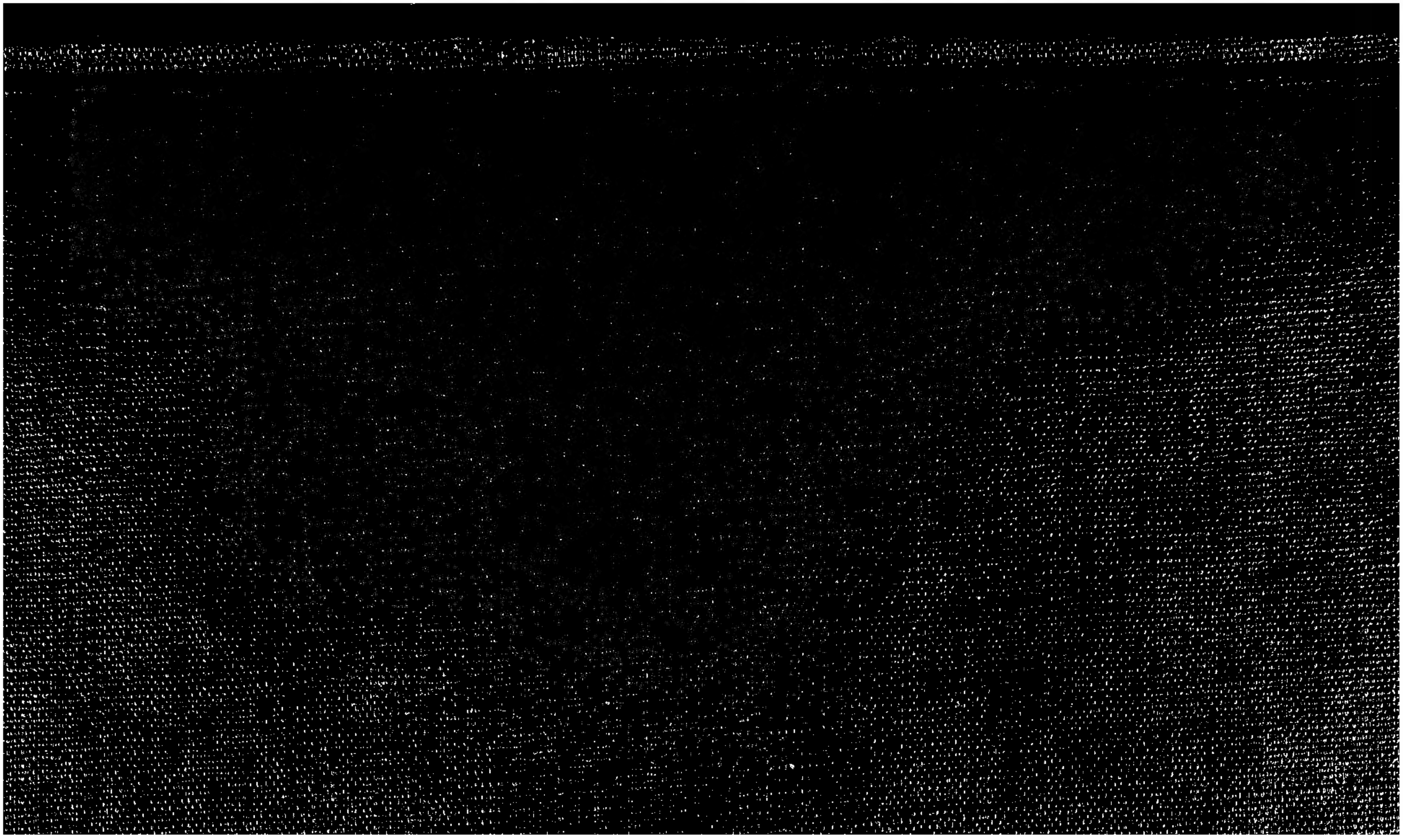
Contributions to the Garden may be deducted from taxable incomes. Bequests may be made in the form of securities, money, or additions to the collections. The following is an approved form of bequest:

I hereby bequeath to The New York Botanical Garden incorporated under the Laws of New York, Chapter 285 of 1891, the sum of ——.

Conditional bequests may be made with income payable to donor or any designated beneficiary during his or her lifetime.

Fellowships or scholarships either in perpetuity or limited to a definite period may be established for practical student-training in horticulture or for botanical research.

All requests for further information should be sent to

THE NEW YORK BOTANICAL GARDEN

BRONX PARK, FORDHAM BRANCH P. O., NEW YORK, N. Y.